DESIGN, CONSTRUCTION AND TESTS OF MULTI - VANE BLOWER IMPELLERS

BY

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ARMOUR INSTITUTE OF TECHNOLOGY

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DESIGN, CONSTRUCTION AND TESTS OF MULTI-VANE BLOWER IMPELLERS

A THESIS

PRESENTED BY

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I

INTRODUCTION

Introduction

1 Preliminary Little or nothing was done towards the application of machinery for the purpose of ventilation until about 1657, when Agricola designed a water-driven mechanical ventilator for the mines. About the year 1680, another similar ventilator was put in operation at the Hartz mines. In February 1849, a Mr. Struve began operating a ventilator of his own design at the Eaglebush Colliery.

In 1861, Mr. J. J. Atkinson gave several valuable papers on the subject of centrifugal fans before the North of England Institute of Mining Engineers, in which he is given credit of being the first to clearly show the superiority of mechanical ventilators over the old steam and furnace system. Every new invention that followed, claimed an efficiency slightly greater than that of common practice.

During late years, a vast amount of experimentation has been performed on mechanical

ventilators, resulting in the refinement of design and construction. The question to-day in installing ventilators is a question of first cost, durability, and efficiency.

The general construction of nearly all types of blowers or ventilators is practically the same, but the special design generally limited to the shape, number and position of blades. Centrifugal blowers are divided into two general groups: the impeller and propeller types. The former is subdivided into two groups: the steel plate, and the multivane fan. As the title indicates, this investigation has been limited to the multivane impeller.

Much discussion and varied tests have been made on the influence of the shape of blade, as related to efficiency and capacity, but the value of this data has been questionable, due to the uncertainty in the measurement of the quantity of air carried.

An attempt has been made in this thesis to

determine the relations of efficiency and capacity for five shapes of blades with respect to each other.

All measurements of velocity have been made by means of the equal area pitot tube. A discussion of this apparatus will be found in part III.

2 Acknowledgment. Acknowledgment is made to Prof. A. H. Anderson for suggestions, criticism, and supervision offered during the course of construction and testing.

II

MURGUE'S THEORY OF CENTRIFUGAL VENTILATING MACHINES

Murgue's Theory

The first satisfactory theory of the centrifugal ventilator was published by Daniel Murgue, engineer to the Colliery Company of Besseges in 1872.

He assumes, first, that all the air delivered to a fan flows through an orifice in a thin plate with a velocity due to the difference of pressure or actual head "h" produced by the operation of the fan. He calls this the"equivalent orifice."

Secondly, he assumes that all the air flows through a similar orifice, which he calls the "orifice of passage", with a velocity due to the head representing the resistance or loss of head "h_o", the area of which he represents by "o".

He proves that the theoretical depression or reading of a water gauge due to the speed of the periphery, "U" is in a perfect fan equivalent to twice the height of column necessary

to generate such velocity in a falling body; that is, if "U" equals the velocity in feet per second and "H" the maximum difference of pressure or "initial depression" $H = \frac{U^2}{g}$.

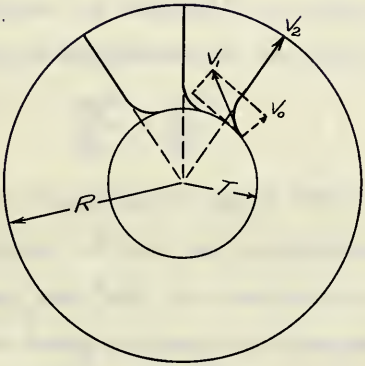

Figure #1

It will be seen from the construction of a fan that the air is drawn in at the center and as the blades turn around, a velocity due to centrifugal action is imparted to the particle of air. Assuming the air to be motionless before entering the fan, the head due to entrance is negative. Let the velocity of the air traversing the inlet be represented by "V_o"; then the resulting loss of head will be :

$$-\frac{V_o^2}{2g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (1)$$

The interval between the two consecutive vanes forms an evasee canal which the air enters with a certain velocity "V_1" and leaves with a lower velocity "V_2". This velocity drop produces, according to Bernoulli's theorem, a gain of pressure expressed by the difference:

$$\frac{V_1^2}{2g} - \frac{V_2^2}{2g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (2)$$

The velocity of entry "V_1" is equal to the resultant of the two velocities; "V_o" being the radial and "wr" the tangential velocity. There is no shock or loss at entrance. Thus we have:

$$V_1^2 = V_o^2 + w^2r^2$$

Substituting this value of "V_1" in the preceding equation, gives:

$$\frac{V_o^2 + w^2r^2}{2g} - \frac{V_2^2}{2g} \quad . \; . \; . \; . \; . \; . \; . \; . \quad (3)$$

The air, moving out from the center, due to the centrifugal action, produces an increase in pressure from the interior to the exterior circumference. Suppose a prismatic element of the air passing through the fan at a distance "x"

from the center, having a radial height "dx", a base "s" in a perpendicular direction, and a density "δ". The mass of this element will be:

$$\frac{\delta s d_x}{g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (4)$$

The centrifugal force developed by its rotation will be:

$$dF = \frac{\delta s d x w^2 x}{g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (5)$$

By dividing the above by "δs", we have the pressure expressed per unit of area in a column of air as follows:

$$dh = \frac{w^2 x dx}{g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (6)$$

Integrating this last equation between the limits "$x = y$" and "$x = R$", we shall have a total difference of pressure from the inlet to the outlet of vanes:

$$h = \frac{w^2R^2 - w^2r^2}{2g} \quad . \; . \; . \; . \; . \; . \; . \; . \quad (7)$$

Adding the results in equation (1), (3) and (7) together, and substituting "$V = wR$", we have the initial depression:

$$H = \frac{U^2}{2g} - \frac{V^2}{2g} \quad . \; . \; . \; \text{General Expression.}$$

where "U" is the velocity of the periphery.

The foregoing is a complete analysis of conditions where the fan wheel revolves without a housing.

In order to be of commercial value, the fan wheel must be enclosed is a housing and the following analysis will be applied.

On examination of Figure #2, it will be noted that there will still be a further pressure increase. The air passing through a suitable duct will change its velocity between the time of leaving the vanes and emerging from the duct. This loss in velocity will effect an increase in pressure, the energy remaining constant.

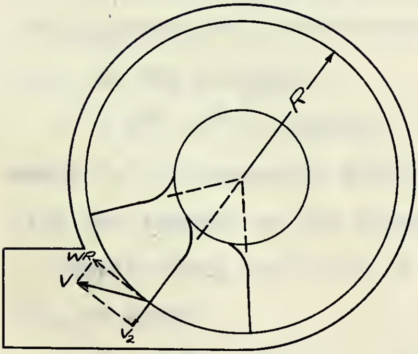

Figure #2

Let "V" = speed of the air entering the duct.

"W" = speed of the air emerging from duct.

Then, the gain in pressure head equals:

$$\frac{V^2}{2g} - \frac{W^2}{2g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (8)$$

The speed "V" is the resultant of the two velocities "u" and "V_2"; "u" being the tangential speed and "V_2", the relative velocity of the air leaving the vanes.

The resultant may be determined from the trigonometric relation between the angles and sides of the triangle:

$$V^2 = u^2 + V_2{}^2 - 2uV_2\cos\alpha \quad . \; . \quad . \; . \; . \; . \; . \quad (9)$$

where "α" is the angle which the vanes make with the tangent to the exterior circumference.

Substituting the value of "V" in equation (8), we have:

$$\frac{u^2}{2g} + \frac{V_2{}^2}{2g} - \frac{2uV\ \cos\alpha}{2g} - \frac{W^2}{2g}$$

Adding this gain of pressure to that obtained without housing, the total head becomes:

$$H = \frac{u^2}{g} - \frac{uV_2\cos\alpha}{g} - \frac{W^2}{g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (10)$$

As may be seen from the preceding equation, "H" is not a maximum where "α" = 90 deg. since for values of "α" between 90 deg. and 180 deg. "$\cos\alpha$" will be negative and give more pressure. This is true when blades are turned forward. If "α" is 90 deg.,

$$H = \frac{u^2}{g} - \frac{W^2}{g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; (11)$$

If the construction of the chimney or duct can be made such that "W_1", the velocity of the air emerging from the duct will become 0, the total pressure head will be:

$$H = \frac{u^2}{g} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; (12)$$

In other words, the theoretical depression is double the head equivalent due to the tangential speed.

In practice, these theoretical results can not be obtained due to friction losses and conversion losses from velocity to static pressures and vice-versa.

III

APPARATUS USED IN TEST

Apparatus Used in Test.

1. Design and Construction of Impellers. The blades were designed with the purpose of obtaining a variation in angles at entrance and exit, with a range between the straight radial and the circular radial blades. The "Sirocco" blade has an angle of entrance of 60 degrees with the tangent at the periphery and has an angle of exit of 22-1/2 degrees with the tangent at the periphery. Having a set of "Sirocco" blades; a blade was designed similar to the "Sirocco", with the exception that the angle of entrance should be the same as the angle of exit with the tangents at the respective peripheries.

The resulting design approached very nearly that of a straight blade, sloping forward at an angle of 60 degrees with the tangent at the outer periphery. Thus, a blade was designed sloping forward at 60 degrees, and one sloping backward at 60 degrees, in order to obtain a

better range of the characteristics with their relation to the angles of blades. Summing up, the following types of blades were constructed: the straight radial, the "Siricco", the backward slope, the forward slope, and the circular radial. Pictures of the blades will be found on plates A, B, C and D, and details of each blade are contained on plate E.

Plate A

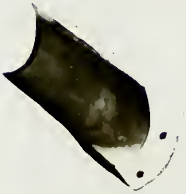

Plate B

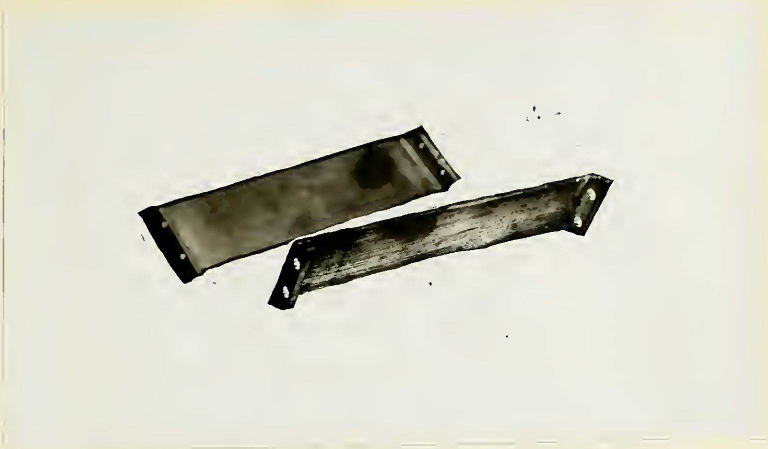

Plate C

Plate D

Having a fan housing available, five runners were constructed to fit the housing and each mounted on an overhanging bearing for the respective tests. A detail of the runners constructed is contained on plate F. Each runner was made up as follows:

One circular steel back plate, 2 feet in diameter and 1-1/2 inch opening cut in center.

One circular steel front plate, 2 feet in diameter and a 12 inch opening cut in center.

One cast iron hub, sloping from 12 inches diameter to 4 inches diameter, mounted on back plate, projecting between plates, and equipped with a 3/8 key way and set screw.

Thirty-five cast aluminum blades, 1/8 inch thick, located on a 2 foot periphery with a 2 inch pitch. Blades milled and two 1/8 inch holes drilled on each end.

One 3/8 inch square key, 6 inches long.

Six 1/2 inch bolts and nuts for securing hub to plate.

One hundred and forty 1/8 inch stove bolts

for securing blades to plates.

After assembling each fan wheel or runner, it was balanced; bringing the center of gravity to coincide with the axis of rotation. Thus smooth running and absence of vibration was effected.

2 Auxiliary Apparatus A layout of the apparatus as used in making the tests is contained on plate G. As may be noted, a fan housing of the involute type was used, made of cold rolled steel plate, with an inlet opening of 12 inches diameter.

The bearings were of the extra long babited type, lubricated by means of four grease cups mounted vertically above the shaft.

The air was discharged from the housing into a sheet iron duct 11.8 inches diameter and 12 feet long.

The fan was connected to a 5 H.P. Interpole motor #5G 3976, by means of a Link Belt "Silent Chain" drive. -The ratio of the fan to

motor speed was approximately 2 : 1.

As was stated in the Introduction, an equal area pitot tube was used in measuring the velocity heads. Until recently, it was assumed that when a number of tubes were equidistantly spaced across one diameter of a circular pipe and all connected together, the dynamic pressures would average up. This does not give the true average pressure as may be seen from the following statement of facts. The pressure transmitted by each separate pitot tube is assumed to be the average for an annular area whose width is, for example, one inch in a duct 10 inches radius and 20 dynamic openings. These annular areas will not be equal since the difference of area between two circles 5 inches and 6 inches radius will not be the same as between two circles 6 inches and 7 inches radius. In order to get pressures which will represent equal areas, the total area of the circle is divided into a particular number of

equal parts. The widths of these annular rings will not be the same, as assumed in the old method, but will gradually decrease as the diameter increases. Thus with an opening spaced at each equal annular area, an average pressure is obtained in the duct. The instrument used was of this automatic type. The tube was placed across the diameter of the duct and contained small openings at the equal annular areas as indicated on plate H.

A 3 inch Ellison Differential Draft Gauge was used in the measurement of all velocity heads; the positive opening being connected, as shown in plate G, to the equal area pitot tube, and the other opening being connected to the static pressure tube.

An 8 inch "U" water gauge was used in the measurement of all static pressure heads; one opening being connected by means of copper tubing to the pressure tube and the other being exposed to the atmosphere.

A Weston Direct Reading Voltmeter #17340 (0 - 150 volts), a Weston Direct Reading Ammeter #25736 (0 - 50 amps.) were used in measuring the power input to the motor.

A portable tachometer #21178 was used in the measurement of the speed of the fan, manufactured by the Industrial Instrument Co., and constructed so that three ranges of speed may be measured directly. The ranges of speed were as follows: 400-1600, 1200-4800 and 4000-16000 R.P.M.

All temperatures were measured by Lloyd's Hygrodeik "wet and dry bulb" thermometer #12940. Curves were located between the thermometers so that the relative humidity could be read directly by tracing the intersection of temperature lines to the humidity scale with a swinging dial.

All barometer readings were taken from a J. Hicks Aneroid Barometer.

IV

METHOD OF PROCEDURE

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Method in Testing

After constructing the runners, each was mounted on the shaft, secured rigidly by means of a key and set screw. Then, the housing was closed by attaching the front plate of the scroll to the frame with 3/8 inch bolts.

The Ellison and "U" gauges were mounted on a board supported by an iron stand. These were connected with copper tubing to the average pitot tube and pressure tube respectively. The connections are quite evident as shown on plate G.

As has been stated in part III, the "O" end of the Ellison tube was connected to the equal area pitot tube and the other opening connected to the pressure tube by means of a Y connection. The purpose was to obtain the velocity reading direct. Naturally, when the dynamic pressure was counteracted by the static pressure, the resultant would be the velocity pressure.

Care was taken to adjust the two pressure

gauges so that they were level and at the zero reading when the blower was idle.

Next, the ammeter was connected in series and the voltmeter shunted across the line entering the motor. A carbon plate rheostat was put in series with the line so that a constant voltage could be maintained. Having all connections made, and noting that the voltmeter and ammeter read in the right direction, the motor was started and the speed of the fan was raised to about 1200 R.P.M. Then readings were taken with the duct wide open, varying the speed from about 1200 R.P.M. down the respective speed notches to about 500 R.P.M.

For each of these corresponding speeds, readings were taken after the voltage had been adjusted to 110, of the velocity head and the static head in inches of water; the revolutions per minute of the fan; and the ammeter reading in amperes. At frequent intervals during the run, readings of the barometer and "wet and

dry bulb" thermometers were taken.

At the completion of these tests for the full open area of discharge, similar tests were made for openings varying, in one inch increments of the diameter, from 11 inches down to 6 inches. Lastly, a set of readings were taken with a"0" area of discharge. The variation in areas of discharge was performed by securing steel plates with the indicated openings, to the end of the 11.8 inch duct.

Precisely the same course of procedure was followed in the testing of all the runners.

When the testing of the runners was completed, all the instruments read sufficiently close so that their calibration was unnecessary, with the exception of the motor.

The motor had not been calibrated since 1912,and the curve of output-input was questionable due to hard usage which it had received since then.

Since the motor was of the interpole com-

pound type, the stray load loss and copper loss at different speeds could be determined by measuring the resistance of the armature and field at the corresponding speeds.

This would require exhaustive testing, so it was decided to check up the 1912 curve of the motor for a particular speed. It had been found in 1912 that the curve did not vary appreciably for the different speeds, but practically followed the same curve. Thus the stray losses and copper losses were measured at an average speed for varying currents. The watts input for "0" load at the different speeds were measured and also the resistance of the field and armature. As may be seen from the calculations, the data was taken for a speed of 420 R.P.M. of the motor, and the output in horsepower was determined for varying current input and constant voltage of 110.

The performance curve obtained checked within one per-cent as compared to the old curve.

Thus, for any ampere reading taken during the tests, the horsepower input could be read directly from the curve.

V

SAMPLE CALCULATIONS

Sample Calculations

Runner #2 6" Orifice Speed 1188 RPM

Barometer = 29.055

Av. Wet Bulb = 60.06

Av. Dry Bulb = 74.73

Av. Rel. Hum. = 42

Humidity taken from "Humidity and Psychrometric Chart" - Carpenter.

Wt. of moisture per cu. ft. at 29.055" Hg. and 74.73 deg. for saturated air = .00135 lbs.

Wt. of moisture, actual condition,

= .42 x .00135 = .000567 lbs. per cu. ft.

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad \text{or} \quad \frac{P_1}{Y_1T_1} = \frac{P_2}{Y_2T_2}$$

P_1 = 29.92" Hg. $P_2 = 29.055 + \frac{\text{In. Water}}{13.6}$

V_1 = .0706 Lbs/cu.ft. V_2 = ?

T_1 = 82 + 460 = 542 deg. T_2 = 75 + 460 = 535 deg.

$$V_2 = \frac{(29.055 + 3.125/13.6)\ .0706 \times 542}{29.92 \times 535}$$

= .0701 lbs./cu.ft. dry air.

V_2 = .0701 + .000567 = .070667#/cu.ft.mixture

$K = \frac{.036 \times 144}{V_2}$ = ft. of air per inch water

$K = \frac{.036 \times 144}{.070667} = 73.4$

Velocity head $h = 73.4 \times 1.6 = 11.72$ ft. of air

Velocity = $\sqrt{2gh} - 8.04\sqrt{11.72} = 27.5$ ft. per sec.

Discharge in cu. ft. per sec. = $Q = FV$

F = area V = Velocity

$Q = .760$ sq.ft. $\times 27.5 = 20.9$ cu.ft. per sec.

Total head = $H = (.16 + 5.25)\ 73.4 = 397$ ft.

Lbs. air moved per sec. = $20.9 \times .070667 = 1.478$#

Horse Power performed =

$$\frac{Q \times V_2' \times H}{550}$$

$$= \frac{20.9 \times .070667 \times 397}{550} = 1.068$$

Horsepower Input from Performance Curve of motor

= 2.925 H.P.

Mechanical Efficiency = $\frac{\text{H.P. Developed}}{\text{H.P. Input}}$

$= \frac{1.068}{2.925} = 36.45\%$

Linear velocity of Impeller Blades =

$V_1 = \frac{\pi DN}{60} = \frac{\pi \times 2 \times 1188}{60} = 124.3$ ft. per sec.

Velocity of air through effective orifice =

$$\frac{\text{Area of Duct}}{K \times \text{Area of Orifice}} \times \text{Velocity in Duct} =$$

$$\frac{.760}{.6 \times .1965} \times 27.5 = 177.1 \text{ ft. per sec.}$$

$$\text{Theoretical Head} = \frac{V_1^2}{g} = \frac{124.3^2}{32.2} = 478 \text{ ft. air}$$

Manometric Efficiency

$$= \frac{\text{Head developed in feet of air}}{\text{Head due to velocity of blades (theor)}}$$

$$= \frac{397}{478} = 83.\%$$

$$Q \times 60 = K_c D^3 N \qquad K_c = \frac{Q \times 60}{D^3 \times N}$$

$$= \frac{20.9 \times 60}{2^3 \times 1188} = .132$$

$$\text{H.P.} = \frac{D^5 N_1^3 K_p}{1000000}$$

N_1 = Rev. per sec.

H. P. = output of motor

D = Diameter in feet.

$$K_p = \frac{1,000,000 \times 2.925}{32 \times 7720} = 11.83$$

Calibration of 5 H.P. Motor

$$R_a = \frac{E_a}{I_a} = \frac{3.9}{9.66} = .403 \text{ ohms.}$$

Speed = 420 R.P.M.

Total Voltage = 110

$I_a = 1.58$ $E_a = 109.6$ $R_f = \frac{110}{1.6} = 68.8$

I_t	Loaded Imput Watts	E_aI_a	Stray	$I_a^2R_a$	$I_f^2R_f$	Total Loss	Output H.P.
80.0	8800	173	172	2500	175	2847	7.98
70.0	7700	173	172	1875	175	2122	7.48
60.7	6680	173	172	1410	175	1757	6.59
55.0	6050	173	172	1143	175	1490	6.11
47.8	5250	173	172	858	175	1205	5.42
40.0	4400	173	172	594	175	941	4.63
35.0	3850	173	172	449	175	796	4.09
30.0	3300	173	172	324	175	671	3.52
25.0	2750	173	172	220	175	567	2.93
20.0	2200	173	172	136	175	483	2.30
15.0	1650	173	172	72.2	175	419.2	1.65
10.0	1100	173	172	28.4	175	375.4	0.970

VI

DISCUSSION AND CONCLUSION

Discussion and Conclusion

In order to make a comparative study of the different blades, curves were plotted for each runner using maximum mechanical efficiency as ordinates and diameters of orifice as abscissas. This would give a maximum efficiency for each runner at some particular diameter of orifice. The area of this particular orifice is called the blast area. From these curves, another set of curves were plotted using "cu. ft." of air per min. at blast area" as ordinates and "r.p.m. of blower" as abscissas. This last set of curves gave the ultimate comparison of the runners as related to the capacity of the blower at the area of highest mechanical efficiency.

On examination of the efficiency curves of the runners, the "Sirocco" blade ,#2,gives the highest mechanical efficiency of 49.4 per cent at the 9 inch orifice. Runners #5, #3, #4 and #1 follow in the order named with maximum efficiencies of 41.7, 37.6, 33.6 and 33.9 per cent respectively.

It is evident from these results that the "Sirocco" blade is by far the best design for the multi-vane impeller. It may be seen from the high efficiency that this blade receives the air with the least shock and imparts the highest velocity to it upon leaving.

It is interesting to note that the circular blade is next highest in efficiency and there is a gap between the efficiency of this blade and the three straight blades which are more nearly together.

The factor of manometric efficiency has some importance in the limit of perfection but the mechanical efficiency and the capacity of the runners is more essential as this gives a practical value with respect to the cost of blowing the air.

Plate T gives a very concise statement of facts concerning the capacity with the different types of blades. We find that the "Sirocco" runner leads in capacity by a large margin at the blast area. Then the other runners follow in the same order as they were mechanically efficient. There is not a marked difference between the cap-

acities of runners #5, #3 and #4. For the runners tested, it was found that the area of maximum efficiency was that of the 8 inch and 9 inch openings.

Runner #1 has the lowest mechanical efficiency and also the lowest capacity. There is quite an appreciable difference between this runner and the next higher.

From the summation of the characteristics determined for the different runners, it is evident that blade #2 is the most efficient design to be used in multi-vane impellers and has such an appreciable superiority over the other designs that there is no question but that its selection should be made in all cases. Since all the blades were cast from metal, there would be no difference in price between any of the blades except by weight. Thus, the initial cost would be the same and naturally the"Sirocco" type should be selected.

If, however, the blades are formed from sheet metal, there will be a difference in cost between the flat and curved blades due to the difference

in price of dies used. In such cases, the net cost may be lower if a straight blade was selected. Preference should then be given to blade #3, since it is the most economical of the straight blades.

Due to the reliable method of measuring the flow of air, the data compiled and the curves drawn should be of some aid in the selection of fan blade designs.

Fred L. Brown Jr.
Oscar A. Anderson

VII

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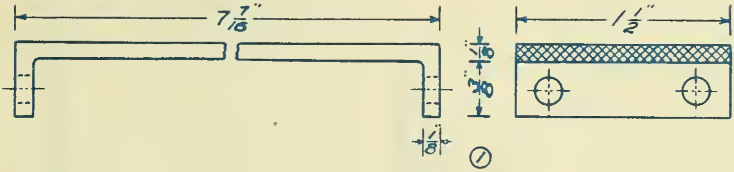
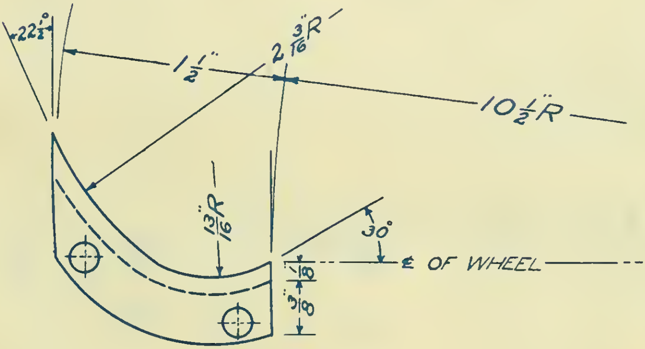
E

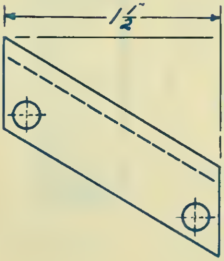

7 7/16"
1 1/2"
1/16"
3/8"
1/8"

①

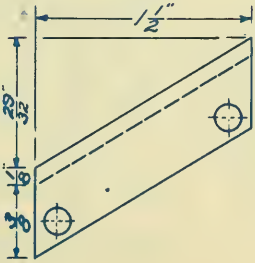

22½°
1 1/2"
2 3/16" R
10 1/2" R
13/16" R
30°
℄ OF WHEEL
1/8"
3/8"

②

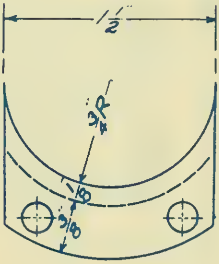
④


1 1/2"

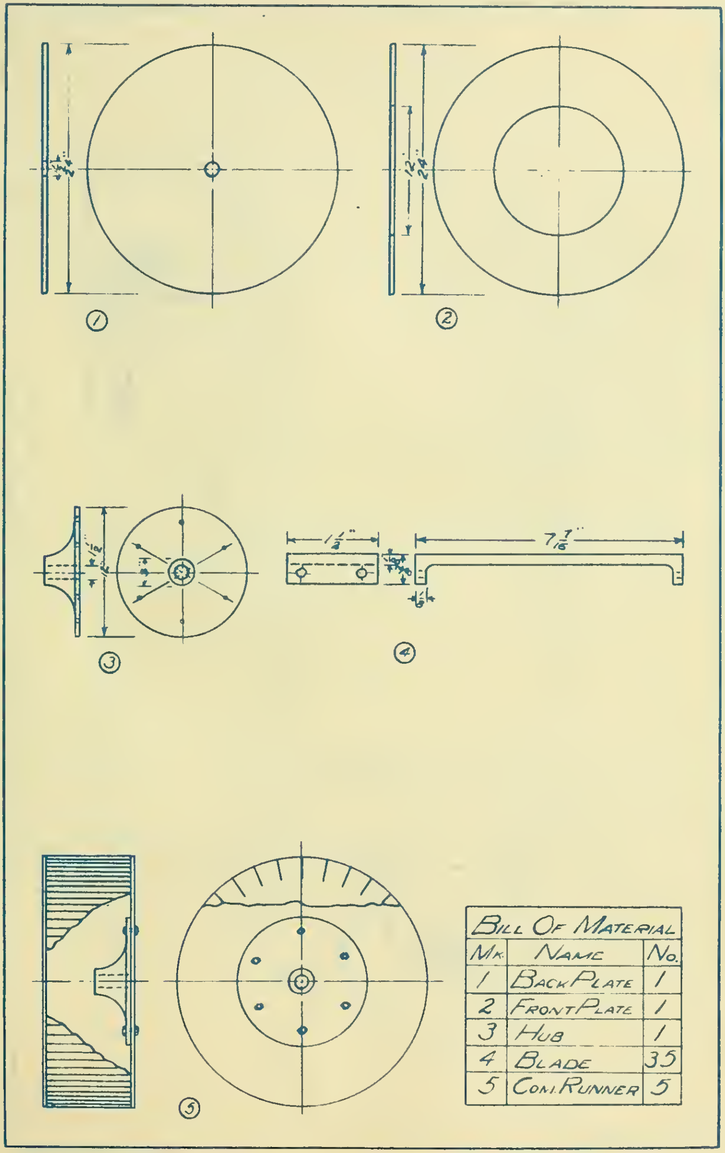
③


1 1/2"
29/32"
1/8"
3/8"

⑤

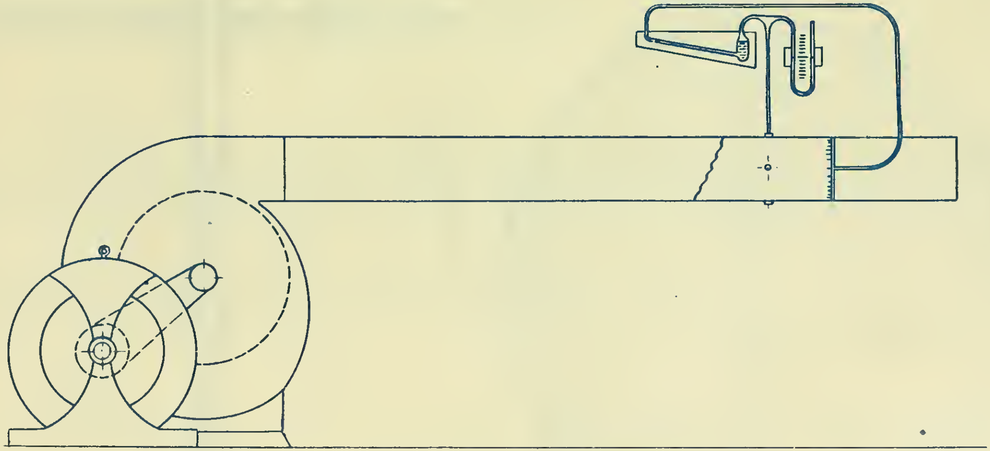

1 1/2"
3/4" R
1/16"
3/8"

F

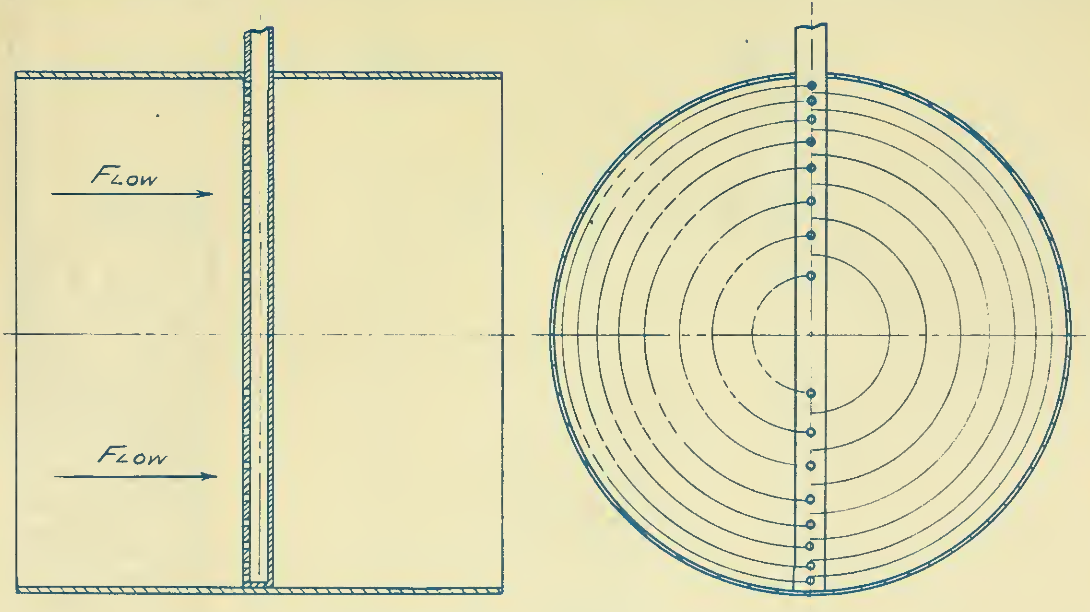


BILL OF MATERIAL		
MK.	NAME	NO.
1	BACK PLATE	1
2	FRONT PLATE	1
3	HUB	1
4	BLADE	35
5	COM. RUNNER	5

G



General Arrangement Of Apparatus



EQUAL AREA PITOT TUBE

H

O" Orifice		
R.P.M Of Blower	Amps. Input	Vel. Hd. In. Wate
1220	25.0	0
1098	19.0	0
990	15.3	0
915	12.8	0
835	10.9	0
760	9.4	0
690	8.5	0
635	7.9	0
587	7.4	0
545	7.3	0
510	7.5	0
		0
		0

TEST OF CENTRIFUGAL BLOWER

RUNNING LOG

RUNNER No. 1

DATE 4-13-15
VOLTS 110

TEMPERATURE WET BULB 60.1°F.
TEMPERATURE DRY BULB 74.6°F.

BAROMETER 29.857
REL. HUMTY. 41 %

0" ORIFICE				6" ORIFICE				7" ORIFICE				8" ORIFICE				9" ORIFICE				10" ORIFICE				11" ORIFICE				11.8" ORIFICE			
R.P.M. OF BLOWER	AMPS INPUT	VEL HD IN. WATER	STAT. HD IN WATER	R.P.M. OF BLOWER	AMPS INPUT	VEL. HD. IN. WATER	STAT. HD. IN WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL HD. IN. WATER	STAT. HD. IN WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL HD IN. WATER	STAT. HD IN WATER	R.P.M. OF BLOWER	AMPS INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD IN WATER	STAT HD IN. WATER
1220	25.0	0	7.00	1205	22.9	.125	4.37	1215	24.9	.220	4.00	1230	27.9	.340	3.50	1230	31.0	.505	2.87	1220	32.7	.655	2.00	1215	34.3	.860	1.13	1228	39.0	1.16	.375
1098	19.0	0	5.60	1092	17.7	.100	3.63	1096	19.3	.175	3.25	1100	20.7	.270	2.87	1105	22.1	.400	2.25	1106	23.9	.530	1.67	1100	26.0	.705	1.00	1110	29.2	.96	.312
990	15.3	0	4.63	990	14.1	.080	3.00	990	15.3	.140	2.75	992	16.4	.220	2.30	998	17.3	.325	1.88	997	18.8	.430	1.38	995	20.2	.580	.87	1000	22.2	.77	.250
915	12.8	0	3.87	910	12.0	.070	2.50	910	12.7	.120	2.25	912	13.7	.180	2.00	915	14.3	.275	1.50	913	15.3	.365	1.12	920	16.5	.490	.75	922	17.9	.66	.250
835	10.9	0	3.25	832	10.4	.055	2.12	832	11.0	.100	1.87	835	11.8	.150	1.75	834	12.1	.225	1.30	838	13.0	.300	1.00	838	13.9	.410	.63	838	14.5	.55	.200
760	9.4	0	2.76	760	9.1	.047	1.75	757	9.6	.080	1.63	757	10.2	.120	1.38	758	10.6	.188	1.13	762	11.2	.250	.88	760	11.7	.335	.50	762	12.3	.45	.200
690	8.5	0	2.25	688	8.0	.039	1.50	690	8.4	.065	1.30	688	8.9	.100	1.12	690	9.1	.150	1.00	690	9.7	.205	.75	688	10.0	.270	.44	690	10.5	.3	.165
635	7.9	0	1.87	640	7.5	.030	1.25	630	7.8	.055	1.12	632	8.1	.085	1.00	635	8.3	.125	.80	632	8.8	.175	.62	637	9.0	.230	.37	635	9.4	.30	[illegible]
587	7.4	0	1.63	585	7.2	.025	1.13	585	7.4	.045	1.00	585	7.7	.070	.88	582	7.8	.105	.75	590	8.0	.145	.50	590	8.4	.200	.32	585	8.8	.26	.125
545	7.3	0	1.37	543	7.1	.020	1.00	540	7.3	.040	.88	540	7.5	.060	.75	542	7.7	.090	.62	540	7.9	.120	.50	545	8.0	.170	.26	542	8.3	.22	.110
510	7.5	0	1.25	510	7.3	.019	.87	508	7.4	.030	.75	505	7.6	.050	.62	502	7.8	.075	.50	503	7.8	.105	.48	502	8.0	.140	.25	513	8.1	.19	.110
		0																													
		0																													

TEST OF CENTRIFUGAL BLOWER

RUNNER No. 1
No. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-13-15.

DISCH. DIAM. 0.0 IN.
DISCH. AREA .00 SQ. FT.
INLET AREA .785 SQ. FT.

RUN No	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	0	498	498	0	0	0	1220	128	25.0	2.92	0	0	98.2	10.86	0
2	0	398	398	0	0	0	1098	115	19.0	2.15	0	0	97.2	10.96	0
3	0	329	329	0	0	0	990	104	15.3	1.70	0	0	99.3	11.84	0
4	0	276	276	0	0	0	915	96	12.8	1.36	0	0	96.6	11.97	0
5	0	231	231	0	0	0	835	86	10.9	1.12	0	0	97.2	12.98	0
6	0	196	196	0	0	0	760	80	9.4	.93	0	0	99.5	14.32	0
7	0	160	160	0	0	0	690	72	8.5	.81	0	0	99.7	16.64	0
8	0	133	133	0	0	0	635	67	7.9	.74	0	0	97.2	19.53	0
9	0	116	116	0	0	0	587	62	7.4	.68	0	0	99.5	22.68	0
10	0	99	99	0	0	0	545	57	7.3	.67	0	0	97.7	27.94	0
11	0	89	89	0	0	0	510	53	7.5	.69	0	0	99.8	35.14	0
12															
13															

TEST OF CENTRIFUGAL BLOWER

Runner No. 1
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.4 In.
Date 4-13-15.

Disch. Diam. 6.0 In.
Disch. Area .196 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No.	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs. Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps. Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	Kp	Kc
1	8.9	312	321	18.2	1.32	.75	1205	126	22.9	2.65	28.3	155	64.6	10.22	.1137
2	7.1	258	265	16.3	1.29	.55	1092	115	17.7	1.95	28.4	138	65.0	10.11	.1123
3	5.7	213	219	14.6	1.06	.41	990	104	14.1	1.50	27.3	124	65.5	10.44	.1107
4	5.0	178	183	13.6	.99	.32	910	95	12.0	1.13	28.4	116	64.7	10.08	.1123
5	3.9	151	155	12.1	.88	.24	832	87	10.4	1.05	23.0	103	65.6	12.30	.1093
6	3.3	125	128	11.2	.82	.18	760	80	9.1	.90	20.3	95	64.9	13.80	.1101
7	2.8	107	110	10.2	.74	.14	688	72	8.0	.75	19.1	86	67.5	15.50	.1110
8	2.1	89	91	8.9	.65	.10	640	67	7.5	.67	15.4	76	64.8	17.40	.1047
9	1.8	80	82	8.2	.60	.08	585	61	7.2	.66	13.2	69	69.8	21.90	.1048
10	1.4	72	73	7.3	.53	.07	543	57	7.1	.64	10.6	62	72.3	27.00	.1006
11	1.3	63	64	7.1	.52	.06	510	53	7.3	.67	8.6	60	71.8	34.00	.1044
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 1
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-13-15.

DISCH. DIAM. 7.0 IN.
DISCH. AREA .267 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	15.7	285	301	24.3	1.77	.964	1215	127	24.9	2.93	32.9	151	59.5	1.00	.1497
2	12.5	232	245	21.6	1.57	.698	1096	115	19.3	2.22	31.4	135	59.8	1.55	.1479
3	10.0	196	206	19.3	1.40	.527	990	104	15.3	1.70	31.0	121	61.6	1.83	.1465
4	8.6	160	169	17.9	1.30	.400	910	95	12.7	1.35	29.6	111	59.8	2.08	.1475
5	7.1	137	141	16.3	1.18	.304	832	87	11.0	1.12	27.1	102	59.5	3.17	.1473
6	5.7	114	122	14.6	1.06	.235	757	79	9.6	.95	24.8	91	62.1	4.76	.1448
7	4.6	92	97	13.2	.96	.170	690	72	8.4	.80	21.2	82	59.8	6.43	.1433
8	3.9	80	84	12.1	.88	.135	630	66	7.8	.72	18.6	76	62.2	9.56	.1442
9	3.2	71	74	11.0	.80	.108	585	61	7.4	.67	16.1	68	63.6	22.76	.1406
10	2.9	62	65	10.3	.75	.089	540	57	7.3	.67	13.3	64	65.5	28.70	.1433
11	2.1	54	56	8.9	.65	.066	508	53	7.4	.67	9.8	56	63.3	34.76	.1319
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 1
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-13-15.

DISCH. DIAM. 8.0 IN.
DISCH. AREA .349 SQ.FT.
INLET AREA .785 SQ.FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	24.3	250	274	30.1	2.19	1.09	1230	129	27.9	3.30	33.0	144	.531	11.97	.1837
2	19.3	206	225	26.8	1.95	.80	1100	115	20.7	2.35	33.9	128	.543	11.92	.1830
3	15.7	164	180	24.2	1.76	.58	992	104	16.4	1.85	31.2	115	.536	12.84	.1833
4	12.9	143	156	21.9	1.59	.45	912	96	13.7	1.47	30.6	104	.550	13.07	.1801
5	10.7	125	136	20.0	1.45	.36	835	87	11.8	1.23	29.0	96	.571	14.27	.1795
6	8.6	98	107	17.9	1.30	.25	757	79	10.2	1.02	24.7	85	.544	15.87	.1775
7	7.1	79	86	16.3	1.18	.19	688	72	8.9	.87	21.7	78	.538	18.03	.1780
8	6.1	71	77	15.0	1.07	.15	632	66	8.1	.76	20.3	72	.569	20.32	.1787
9	5.0	61	66	13.7	.99	.12	585	61	7.7	.70	17.5	65	.576	23.64	.1752
10	4.3	54	58	12.6	.91	.10	540	57	7.5	.68	14.2	60	.580	29.14	.1756
11	3.6	44	48	11.6	.84	.07	505	53	7.6	.69	10.9	55	.554	36.18	.1717
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER No. 1
No. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT
WIDTH RUNNER 7.4 IN.
DATE 4-13-15.

DISCH. DIAM. 9.0 IN.
DISCH. AREA .442 SQ. FT.
INLET AREA .785 SQ. FT.

RUN No	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD FT. OF AIR	CU. FT. AIR MOVED/SEC	LBS AIR MOVED/SEC	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	36.2	206	242	36.8	2.66	1.17	1230	129	31.0	3.64	32.2	139	46.8	13.2	.2246
2	28.7	161	190	32.7	2.37	.82	1105	116	22.1	2.60	31.4	123	45.4	13.0	.2220
3	23.3	134	157	29.5	2.14	.61	998	105	17.3	1.93	31.7	111	46.2	13.1	.2217
4	19.7	107	127	27.1	1.96	.45	915	96	14.3	1.60	28.4	102	44.5	14.1	.2226
5	16.2	93	109	24.5	1.77	.35	834	87	12.1	1.28	27.6	93	45.9	14.9	.2218
6	13.5	80	94	22.4	1.62	.28	758	79	10.6	1.08	25.7	84	47.8	16.7	.2218
7	10.8	71	82	20.0	1.45	.22	690	72	9.1	.90	24.2	76	50.7	18.5	.2180
8	9.0	57	66	18.3	1.32	.16	635	67	8.3	.80	19.9	69	48.0	21.1	.2158
9	7.5	55	61	16.8	1.22	.13	582	61	7.8	.73	18.6	63	52.9	24.9	.2160
10	6.4	55	51	15.5	1.12	.11	542	57	7.7	.71	14.8	57	51.2	30.1	.2152
11	5.4	36	41	14.2	1.03	.08	502	53	7.8	.72	10.6	53	47.8	38.7	.2116
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 1
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-13-15.

DISCH. DIAM. 10.0 IN.
DISCH. AREA .547 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	46.9	143	190	41.8	3.03	1.06	1220	128	32.7	3.85	27.2	127	36.8	14.33	.2570
2	38.0	120	158	37.6	2.72	.78	1106	116	23.9	2.77	28.1	105	37.8	13.85	.2550
3	30.8	98	129	34.0	2.46	.58	997	105	18.8	2.13	27.1	103	38.1	14.50	.2555
4	26.2	81	107	31.2	2.26	.44	913	96	15.3	1.70	25.8	95	37.4	15.07	.2570
5	21.4	72	93	28.3	2.05	.35	838	88	13.0	1.38	25.1	86	38.8	15.83	.2535
6	17.9	61	81	25.9	1.88	.27	762	80	11.2	1.17	23.4	79	40.7	17.84	.2548
7	14.7	53	68	23.4	1.70	.21	690	72	9.7	.97	21.8	70	42.0	19.94	.2546
8	12.5	44	57	21.6	1.56	.16	632	66	8.8	.85	19.2	66	41.9	22.74	.2564
9	10.4	36	46	19.7	1.43	.13	590	62	8.0	.75	17.2	60	38.9	24.67	.2506
10	8.6	35	44	17.9	1.30	.11	540	57	7.9	.73	14.4	55	44.5	31.30	.2488
11	7.5	34	41	16.8	1.22	.09	503	53	7.8	.72	12.6	51	44.7	38.42	.2498
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TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 1
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-13-15.

DISCH. DIAM. 11.0 IN.
DISCH. AREA .66 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	61.7	80	142	48.0	3.47	.900	1215	127	34.3	4.08	22.1	121	28.2	15.36	.2965
2	50.5	72	122	43.5	3.15	.700	1100	115	26.0	3.05	23.0	110	29.5	15.47	.2968
3	41.5	62	104	39.4	2.85	.541	995	104	20.2	2.30	23.5	99	30.9	15.77	.2970
4	35.1	54	89	36.2	2.62	.423	920	96	16.5	1.83	23.2	92	30.8	15.83	.2955
5	29.4	45	74	33.1	2.39	.324	838	88	13.9	1.50	21.6	84	30.9	17.22	.2964
6	24.0	36	60	29.9	2.16	.236	760	80	11.7	1.09	21.6	76	30.3	16.77	.2953
7	19.4	32	51	26.9	1.95	.179	688	72	10.0	1.00	17.9	68	31.3	20.73	.2930
8	16.5	26	43	24.8	1.80	.141	637	67	9.0	.87	16.2	62	31.3	22.72	.2878
9	14.3	23	37	23.1	1.67	.112	590	62	8.4	.80	14.0	58	30.9	26.32	.2938
10	12.2	19	31	21.3	1.54	.088	545	57	8.0	.75	11.7	54	31.0	31.27	.2932
11	10.0	18	28	19.4	1.41	.071	502	53	8.0	.75	9.5	49	32.4	40.04	.2892
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 1	DIAM. RUNNER 2 FT.	DISCH. DIAM. 11.8 IN.
NO. BLADES 35	WIDTH RUNNER 7.4 IN.	DISCH. AREA .76 SQ. FT.
VOLTS 110	DATE 4-13-15.	INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	83.3	27	110	55.7	4.00	.805	1228	129	39.0	4.55	17.7	122	21.34	16.59	.3404
2	69.2	23	92	50.8	3.67	.612	1110	116	29.2	3.44	17.8	111	21.70	16.97	.3430
3	54.8	18	73	45.2	3.26	.432	1000	105	22.2	2.57	17.2	99	21.30	17.35	.3395
4	47.4	18	65	42.0	3.04	.360	922	97	17.9	2.00	18.0	92	22.34	17.35	.3407
5	39.5	15	54	38.3	2.77	.271	838	88	14.5	1.57	17.2	84	22.40	18.05	.3430
6	32.3	15	47	34.7	2.51	.212	762	80	12.3	1.30	16.4	76	23.50	19.83	.3417
7	22.3	12	34	28.8	2.08	.129	690	72	10.5	1.08	12.0	63	20.98	22.20	.3130
8	21.9	8	30	28.6	2.07	.114	635	66	9.4	.93	12.3	63	22.20	24.54	.3374
9	18.3	9	27	26.1	1.89	.090	585	61	8.8	.87	10.3	57	23.25	29.30	.3350
10	16.2	8	24	24.6	1.78	.076	542	57	8.3	.80	9.7	54	23.90	33.90	.3400
11	13.6	8	22	22.5	1.63	.064	503	53	8.1	.76	8.4	49	24.86	40.26	.3360
12															
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0" Orifice			
R.P.M. Of Blower	Amps. Input	Vel. Hd. In. Water	Stat. Hd
1204	19.0	0	6.
1090	14.8	0	5.
922	12.1	0	4.
914	10.3	0	3.
835	8.7	0	3.
760	7.8	0	2.
690	6.8	0	2.
640	6.4	0	1.
590	6.1	0	1.
540	6.1	0	1.2
500	6.3	0	1.2
		0	
		0	

TEST OF CENTRIFUGAL BLOWER

Running Log

Runner No. 2

Date 5 - 7 -15. Temperature Wet Bulb 60.0°F. Barometer 29.055
Volts 110 Temperature Dry Bulb 74.7°F. Rel. Humty. 40.0 %

0" Orifice				6" Orifice				7" Orifice				8" Orifice				9" Orifice				10" Orifice				11" Orifice				11.8" Orifice			
R.P.M. Of Blower	Amps Input	Vel. Hd. In. Water	Stat. Hd In Water	R.P.M. Of Blower	Amps Input	Vel. Hd. In. Water	Stat. Hd. In. Water	R.P.M. Of Blower	Amps. Input	Vel Hd In. Water	Stat. Hd In. Water	R.P.M. Of Blower	Amps. Input	Vel. Hd In. Water	Stat. Hd In. Water	R.P.M. Of Blower	Amps. Input	Vel. Hd. In. Water	Stat. Hd. In. Water	R.P.M. Of Blower	Amps. Input	Vel. Hd. In. Water	Stat. Hd In. Water	R.P.M. Of Blower	Amps. Input	Vel. Hd. In. Water	Stat. Hd. In. Water	R.P.M. Of Blower	Amps. Input	Vel. Hd In Water	Stat. Hd In. Water
1204	19.0	0	6.25	1188	25.	.16	5.25	1250	35.7	.35	5.75	1252	44.3	.61	5.75	1274	60.7	1.07	5.25	1230	71.	1.515	3.875	1210	80.	1.95	2.125	1175.	76.5	2.36	.625
1090	14.8	0	5.125	1080	20.5	.13	4.375	1120	26.0	.28	4.75	1135	32.	.50	4.60	1140	41.6	.86	4.25	1150	52.8	1.33	3.50	1190	70.	1.92	2.00	1140.	71.6	2.17	.58
922	12.1	0	4.25	988	15.8	.11	3.750	1010	20.0	.23	3.75	1020	24.	.405	3.75	1020	29.6	.69	3.50	1030	36.0	1.06	2.625	1040	43	1.45	1.50	1035.	46.9	1.75	.50
914	10.3	0	3.50	910	13.0	.095	3.000	920	16.4	.19	3.125	930	18.9	.335	3.00	930	23.1	.57	2.80	930	27.7	.87	2.125	940	31.8	1.19	1.25	940.	34.8	1.50	.47
835	8.7	0	3.00	835	11.0	.080	2.50	840	13.4	.16	2.50	850	15.3	.28	2.50	847	18.4	.48	2.375	845.	21.2	.71	1.875	850	23.9	.97	1.00	850.	26.4	1.23	.375
760	7.8	0	2.50	764	9.3	.070	2.00	770	11.4	.135	2.125	770	12.8	.23	2.06	770	14.6	.39	1.90	770	16.9	.58	1.50	770	18.6	.78	.875	770.	20.3	.99	.25
690	6.8	0	2.00	690	8.0	.055	1.75	700	9.8	.11	1.75	700	10.8	.19	1.75	695	12.2	.325	1.50	690	13.7	.48	1.25	690	14.8	.64	.750	690	16.2	.81	.20
640	6.4	0	1.75	640	7.3	.045	1.50	650	8.9	.10	1.50	646	9.7	.16	1.50	640	10.8	.28	1.375	640	12.0	.41	1.00	640	12.8	.55	.625	640.	13.6	.67	.15
590	6.1	0	1.50	590	6.8	.04	1.25	600	8.3	.08	1.25	595	9.0	.14	1.25	595	9.8	.24	1.125	597	10.7	.35	1.00	590	11.4	.465	.500	590.	11.9	.58	.125
540	6.1	0	1.25	500	6.8	.03	1.00	550	8.0	.07	1.125	550	8.4	.12	1.06	545	9.2	.205	1.000	540	10.	.30	.80	540	10.5	.400	.500	540.	11.0	.505	.125
500	6.3	0	1.25					510	8.0	.06	1.000	500	8.4	.105	1.00	503.	9.0	.175	.93	500	9.5	.26	.70	500	10.0	.345	.450	500.	10.4	.43	.100
		0																													
		0																													

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 2
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.0 IN.
DATE 5 - 7 - 15.

DISCH. DIAM. 0.0 IN.
DISCH. AREA 0.0 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	0	458	458	0	0	0	1204	126.2	19	2.16	0	0	92.7	8.36	0
2	0	376	376	0	0	0	1090	114.2	14.8	1.62	0	0	93.	8.45	0
3	0	312	312	0	0	0	992	104.	12.1	1.27	0	0	92.8	8.78	0
4	0	257	257	0	0	0	914	95.7	10.3	1.05	0	0	90.6	9.28	0
5	0	220	220	0	0	0	835	87.5	8.7	.85	0	0	93.6	9.85	0
6	0	183	183	0	0	0	760	79.7	7.8	.73	0	0	92.8	11.20	0
7	0	147	147	0	0	0	690	72.3	6.8	.60	0	0	90.6	12.30	0
8	0	128	128	0	0	0	640	67.0	6.4	.55	0	0	91.8	14.2	0
9	0	110	110	0	0	0	590	61.8	6.1	.51	0	0	92.7	16.8	0
10	0	91.6	91.6	0	0	0	540	56.6	6.1	.51	0	0	92.1	21.85	0
11	0	91.6	91.6	0	0	0	500	52.4	6.3	.54	0	0	99.0	29.2	0
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 2.
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.0 IN.
DATE 5 - 7 - 15.

DISCH. DIAM. 6.0 IN.
DISCH. AREA .196 SQ.FT.
INLET AREA .785 SQ.FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	11.72	385.3	397	20.9	1.48	1.068	1188	124.3	25.	2.925	36.45	177.5	83.	11.8	.132
2	9.54	321.46	331	18.85	1.332	.801	1080	113.2	20.5	2.35	34.1	160.5	83.	12.6	.131
3	8.06	274.94	283	17.35	1.228	.631	988	103.5	15.8	1.725	36.6	147.2	85.	12.4	.132
4	6.96	220.04	227	16.10	1.14	.470	910	95.4	13.0	1.375	34.2	137.	80.4	12.3	.1325
5	5.86	183.14	189	14.8	1.048	.360	835	87.5	11.0	.925	39.0	125.8	79.2	10.7	.133
6	5.13	146.87	152	13.9	.982	.272	764	80.0	9.3	.800	34.0	118.	76.5	12.1	.1365
7	4.04	128.4	132.4	12.28	.868	.209	690	72.3	8.0	.750	27.9	104.1	81.5	15.4	.1331
8	3.30	110.	113.3	11.10	.785	.162	640	67.0	7.3	.675	24.0	94.5	81.4	17.4	.130
9	2.93	91.7	94.6	10.43	.739	.127	590	61.8	6.8	.600	21.2	88.8	79.9	19.7	.1328
10	2.20	73.3	75.5	9.07	.641	.088	500	52.4	6.8	.600	14.7	77.2	88.5	32.4	.136
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER No. 2	DIAM. RUNNER 2 FT.	DISCH. DIAM. 7.0 IN.
No. BLADES 35	WIDTH RUNNER 7.0 IN.	DISCH. AREA .2672 SQ. FT.
VOLTS 110	DATE 5 - 7 - 15.	INLET AREA .785 SQ. FT.

RUN No.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	25.7	421.8	447.5	31.	2.19	1.78	1250	131	35.7	4.16	42.8	221.	84.	14.4	.186
2	20.5	348.5	369.	27.7	1.96	1.313	1120	117.4	26.	3.05	43.	197.5	82.2	14.65	.1852
3	16.9	275.1	292.	25.1	1.775	.943	1010	105.9	20.	2.28	41.4	179.0	83.9	14.92	.1842
4	13.4	224.6	243.	22.8	1.61	.712	920	96.4	16.4	1.82	39.1	162.	84.3	15.80	.186
5	11.7	183.3	195.	20.9	1.48	.524	840	88.0	13.4	1.43	36.6	149.	81.1	16.30	.1867
6	9.9	157.1	167	19.2	1.36	.412	770	80.7	11.4	1.20	34.3	137.2	82.0	17.70	.187
7	8.06	128.44	136.5	17.32	1.225	.304	700	73.4	9.8	.98	31.0	133.8	81.5	19.30	.1858
8	7.34	109.96	117.3	16.6	1.17	.250	650	68.1	8.9	.86	29.1	128.4	81.6	21.10	.1915
9	5.86	91.64	97.5	14.8	1.047	.186	600	62.9	8.3	.80	23.25	105.4	79.5	25.0	.185
10	5.13	82.57	87.7	13.88	.98	.156	550	57.6	8.0	.75	20.8	99.0	85.1	30.4	.1892
11	4.40	73.4	77.8	12.81	.906	.128	510	53.5	8.0	.75	17.05	91.5	87.5	37.1	.1888
12															
13															

J3

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 2
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.0 IN.
DATE 5 - 7 - 15.

DISCH. DIAM. 8.0 IN.
DISCH. AREA .349 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	44.75	421.5	466.	40.9	2.89	2.45	1252	131.4	44.3	5.1	48.0	195.	87.5	17.5	.245
2	36.7	337.3	374	37.0	2.62	1.78	1135	119.0	32	3.75	47.5	177.	85.0	17.3	.245
3	29.7	275.3	305	33.3	2.35	1.315	1020	107.	24	2.8	47.0	159.	85.8	17.8	.245
4	24.6	220.4	245	30.3	2.14	.955	930	97.5	18.9	2.13	44.8	144.5	83.0	17.9	.247
5	20.5	183.5	204	27.6	1.95	.725	850	89.0	15.3	1.70	42.6	132.	83.0	18.7	.246
6	16.9	150.1	167	25.1	1.77	.539	770	80.7	12.8	1.37	39.4	120.	82.5	20.2	.244
7	13.9	128.1	142	22.8	1.61	.416	700	73.4	10.8	1.11	36.6	108.8	85.0	21.8	.344
8	11.7	110.3	122	20.9	1.48	.328	645	67.6	9.7	.98	33.5	99.7	85.8	24.7	.241
9	10.3	91.7	102	19.6	1.387	.2575	595	62.4	9.0	.87	29.6	93.5	84.5	27.9	.245
10	8.8	77.7	86.5	18.1	1.28	.202	550	57.6	8.4	.80	25.25	86.5	79.4	32.45	.247
11	7.34	73.66	81.0	16.6	1.172	.173	500	52.4	8.4	.80	21.65	79.2	95.0	43.15	.249
12															
13															

J_4

TEST OF CENTRIFUGAL BLOWER

RUNNER NO 2
NO BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT
WIDTH RUNNER 7.0 IN.
DATE 5-7-15.

DISCH. DIAM. 9.0 IN
DISCH. AREA .443 SQ FT.
INLET AREA .785 SQ. FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT OF AIR	TOTAL HD FT OF AIR	CU FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	78.5	386.5	464	54.	3.82	3.22	1274	133.5	60.7	6.58	48.9	204	83.6	21.5	.318
2	63.0	312.	375	48.5	3.43	2.34	1140	119.5	41.6	4.81	48.6	182.5	84.6	21.9	.319
3	50.5	257.5	308	43.4	3.07	1.715	1020	107.	29.6	3.47	49.4	163.5	86.5	22.	.3185
4	41.8	205.2	247	39.5	2.79	1.254	930	97.5	23.1	2.67	47.0	149.	83.6	22.41	.319
5	35.2	173.8	209	36.2	2.56	.973	847	88.75	18.4	2.07	47.0	136.5	85.6	23.	,320
6	28.6	139.4	168	32.7	2.31	.706	770	80.7	14.6	1.57	45.0	123.	83.0	23.2	.318
7	23.8	110.2	134	29.8	2.10	,513	695	72.8	12.2	1.30	39.5	112.5	81.6	26.2	,322
8	20.5	100.9	121.4	27.65	1.955	,398	640	67.0	10.8	1.11	35.9	104	87.0	28.6	,324
9	17.6	82.4	100.	25.6	1.810	.330	595	62.4	9.8	.98	33.7	96.5	82.7	31.4	.352
10	15.0	73.5	88.5	23.7	1.675	.2695	545	57.1	9.2	.90	30.7	89.1	87.5	37.6	.326
11	12.8	68.3	81.1	21.85	1.545	.228	503.	52.7	9.0	.87	26.2	82.3	94.1	46.0	.326
12															
13															

TEST OF CENTRIFUGAL BLOWER

Runner No. 2
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.0 In.
Date 5 - 7 - 15.

Disch. Diam. 10.0 In.
Disch. Area .545 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No.	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs. Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	K_p	K_c
1	111.	285	396	64.5	4.55	3.28	1230	129	71	7.45	44.	197.	76.5	27.0	.392
2	97.8	257.2	355	60.4	4.25	2.76	1150	121.6	52.8	5.88	47.	184.5	77.4	26.1	.394
3	78.	193	271	54.	3.81	1.88	1030	108.	36.	4.20	44.75	165.	74.9	26.0	.397
4	64.	156	220	48.9	3.45	1.38	930	97.5	27.7	3.25	42.5	149.	72.3	27.3	.394
5	52.1	137.8	189.9	44.1	3.11	1.075	845	88.5	21.2	2.44	44.1	135.	78.0	27.3	.392
6	42.6	110.4	153.	39.9	2.82	.785	770	80.7	16.9	1.87	42.1	122.	75.6	27.6	.388
7	35.3	91.7	127.	36.4	2.57	.594	690	72.3	13.7	1.47	40.4	111.	78.1	30.2	.396
8	30.1	73.4	103.5	33.5	2.36	.446	640	67.0	12.0	1.25	35.7	102.	74.3	32.2	.392
9	25.7	73.4	99.1	31.0	2.18	.395	597	62.5	10.7	1.10	35.9	94.8	81.7	34.9	.390
10	22.	58.8	80.8	28.7	2.02	.298	540	56.6	10.0	1.00	29.8	87.6	81.3	42.9	.395
11	19.1	51.4	70.5	26.7	1.88	.242	500	52.4	9.5	.95	25.5	81.5	82.6	51.2	.400
12															
13															

J6

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 2
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.0 IN.
DATE 5 - 7 - 15.

DISCH. DIAM. 11.0 IN.
DISCH. AREA .660 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	143.5	156.5	300	73.3	5.15	2.83	1210	127.	80	7.98	35.4	185.	59.8	30.4	.455
2	141.	147	288	72.8	5.11	2.69	1190	124.7	70	7.35	36.6	184.	54.6	29.4	.459
3	107.	110	217	63.2	4.44	1.76	1040	109.	43	4.95	35.6	159.4	58.9	29.7	.456
4	87.6	91.9	179.5	57.1	4.00	1.315	940	98.5	31.8	3.75	35.0	144.	59.5	30.42	.456
5	71.5	73.5	145.	51.6	3.63	.961	850	89.0	23.9	2.76	34.8	130.2	58.9	30.40	.456
6	57.5	64.5	122	46.4	3.26	.727	770	80.7	18.6	2.10	34.6	118.	60.3	31.0	.452
7	47.1	55.1	102.2	41.9	2.94	.55	690	72.3	14.8	1.61	34.2	105.8	63.1	33.1	.455
8	40.5	46.0	86.5	38.9	2.73	.432	640	67.0	12.9	1.37	31.5	98.	62.0	35.3	.456
9	34.2	36.8	71.0	35.7	2.50	.321	590	61.8	11.4	1.18	27.6	90.	54.6	38.8	.454
10	29.5	36.8	66.3	33.2	2.34	.283	540	56.6	10.5	1.08	26.2	83.8	66.7	46.2	.461
11	25.4	33.1	58.5	30.8	2.16	.231	500	52.4	10.0	1.00	23.1	77.8	68.5	54.0	.461
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 2
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.0 IN.
DATE 5 - 7 - 15.

DISCH. DIAM. 11.8 IN.
DISCH. AREA .760 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	174.7	46.3	221	80.9	5.65	2.28	1175	123	76.5	7.9	28.85	106.4	46.6	32.9	.515
2	160.5	35.5	196	77.5	5.42	1.935	1140	119.5	71.6	7.48	25.9	102.	45.2	34.0	.510
3	129.5	37.0	166.5	69.5	4.86	1.475	1035	108.5	46.9	5.33	27.65	91.5	45.6	32.5	.504
4	111.0	35.	146.	64.4	4.50	1.195	940	98.5	34.8	4.08	29.3	84.8	48.5	33.1	.513
5	91.0	28.	119	58.25	4.08	.883	850	89.0	26.4	3.09	28.6	76.7	48.3	34.0	.514
6	73.2	18.6	91.8	52.25	3.66	.611	770	80.7	20.3	2.32	26.4	68.9	45.4	34.3	.509
7	60.0	14.8	74.8	47.3	3.31	.452	690	72.3	16.2	1.80	25.1	62.3	46.0	37.0	.514
8	49.5	11.1	60.6	43.0	3.01	.332	640.	67.0	13.6	1.45	22.9	56.6	43.5	37.4	.504
9	43.0	9.1	52.1	40.0	2.80	.265	590	61.8	11.9	1.25	21.2	52.8	44.	41.1	.508
10	37.4	9.2	46.6	37.3	2.61	.221	540.	56.6	11.0	1.14	19.4	49.1	46.9	48.7	.518
11	31.8	7.4	39.2	34.5	2.42	.172	500	52.4	10.4	1.06	16.22	45.5	45.9	57.2	.516
12															
13															

J8

O" ORIFICE		
R.P.M. OF BLOWER	AMPS INPUT	VEL. HD. IN. WATER
1100	16.7	0
985	13.2	0
910	11.3	0
840	9.8	0
770	8.6	0
696	7.6	0
640	7.0	0
594	6.8	0
550	6.8	0
505	6.9	0
		0
		0
		0

TEST OF CENTRIFUGAL BLOWER

RUNNING LOG

RUNNER No. 3

DATE 4-12-15.
VOLTS 110

TEMPERATURE WET BULB 63.6°F.
TEMPERATURE DRY BULB 80.9°F.

BAROMETER 29.82
REL. HUM'TY. 38.0 %

0" ORIFICE				6" ORIFICE				7" ORIFICE				8" ORIFICE				9" ORIFICE				10" ORIFICE				11" ORIFICE				11.8" ORIFICE			
R.P.M. OF BLOWER	AMPS INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER
1150	16.7	0	5.25	1250	30.0	.170	5.75	1220	32.3	.210	5.13	1260	39.5	.415	4.75	1275	49.0	.730	4.06	1215	53.0	1.08	3.00	1180	57.0	1.43	1.75	1140	60.7	1.77	.500
985	13.2	0	4.25	1130	22.5	.135	4.75	1130	24.3	.190	4.25	1130	29.2	.385	3.88	1140	37.5	.595	3.50	1145	43.3	.96	2.75	1130	48.8	1.31	1.50	1100	51.4	1.61	.500
912	11.3	0	3.75	1035	17.2	.110	3.87	980	19.2	.180	3.50	1010	22.6	.322	3.13	1025	26.3	.480	2.80	1010	30.0	.76	2.13	1020	36.2	1.06	1.30	1010	39.3	1.36	.500
840	9.8	0	3.13	930	14.3	.090	3.25	920	15.8	.170	3.00	930	18.0	.260	2.62	940	20.7	.405	2.37	925	22.9	.61	1.75	940	28.4	.93	1.13	940	30.7	1.13	.450
770	8.6	0	2.62	850	12.2	.075	2.75	845	13.2	.145	2.50	845	14.8	.220	2.25	850	16.5	.325	1.94	840	18.2	.50	1.50	845	21.3	.73	1.00	850	23.3	.96	.400
696	7.6	0	2.13	770	10.3	.060	2.25	770	11.1	.120	2.06	775	12.3	.180	1.88	770	13.7	.270	1.63	770	15.3	.43	1.25	765	17.6	.61	.85	770	18.7	.82	.325
640	7.0	0	1.87	700	8.9	.050	1.87	700	9.5	.100	1.75	700	10.3	.145	1.50	700	11.3	.220	1.40	700	12.5	.34	1.00	685	13.7	.49	.62	695	15.0	.70	.250
594	6.8	0	1.63	640	8.0	.040	1.63	640	8.7	.085	1.50	645	9.1	.120	1.37	645	9.9	.180	1.25	640	10.8	.28	.94	640	12.0	.42	.50	645	12.8	.56	.250
550	6.8	0	1.27	590	7.6	.035	1.38	595	8.0	.075	1.25	600	8.5	.105	1.13	590	9.0	.155	1.00	595	9.6	.24	.80	600	10.7	.36	.50	590	11.2	.48	.250
525	6.9	0	1.25	550	7.3	.030	1.25	550	7.7	.065	1.13	555	8.0	.090	1.00	545	8.3	.130	.87	545	8.9	.21	.75	550	9.8	.31	.50	545	10.0	.41	.245
		0		515	7.2	.020	1.13	510	7.8	.055	1.00	515	8.0	.075	.87	520	8.3	.110	.75	510	8.8	.17	.63	515	9.3	.27	.38	515	9.8	.35	.245
		0																													
		0																													

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 3
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER IN.
DATE 4-12-15.

DISCH. DIAM. 0.0 IN.
DISCH. AREA .00 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	0	379	379	0	0	0	1100	115	16.7	1.85	0	0	92.1	9.38	0
2	0	307	307	0	0	0	985	103	13.2	1.40	0	0	93.2	9.89	0
3	0	271	271	0	0	0	910	95	11.3	1.18	0	0	96.2	10.58	0
4	0	226	226	0	0	0	840	88	9.8	.98	0	0	93.9	11.17	0
5	0	190	190	0	0	0	770	81	8.6	.81	0	0	99.8	11.98	0
6	0	153	153	0	0	0	696	73	7.6	.70	0	0	99.8	14.02	0
7	0	136	136	0	0	0	640	67	7.0	.63	0	0	97.1	16.08	0
8	0	117	117	0	0	0	594	62	6.8	.60	0	0	98.0	19.32	0
9	0	99	99	0	0	0	550	58	6.8	.61	0	0	96.8	24.74	0
10	0	90	90	0	0	0	505	53	6.9	.61	0	0	99.8	32.00	0
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 3
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-12-15.

DISCH. DIAM. 6.0 IN.
DISCH. AREA .196 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	12.3	414.7	427.0	21.4	1.54	.913	1250	131.0	30.0	3.53	25.9	182.1	80.1	12.19	.1283
2	9.7	342.3	352.0	19.0	1.37	.690	1130	118.5	22.5	2.60	26.5	161.5	81.0	12.16	.1264
3	7.9	279.4	287.3	17.2	1.24	.628	1005	105.4	17.2	1.92	32.7	145.8	83.0	12.78	.1283
4	6.5	234.3	240.8	15.5	1.11	.477	930	97.5	14.3	1.57	30.4	131.8	81.5	13.18	.1253
5	5.4	198.1	203.5	14.2	1.02	.368	850	89.1	12.2	1.29	28.5	120.4	88.3	14.19	.1251
6	4.3	162.2	166.5	12.7	.91	.269	770	80.7	10.3	1.05	25.6	107.7	82.1	15.52	.1235
7	3.6	135.2	138.8	11.6	.83	.205	700	73.4	8.9	.86	23.9	98.3	82.8	16.93	.1242
8	2.9	117.1	120.0	10.4	.74	.159	640	67.1	8.0	.75	21.2	88.0	85.8	19.32	.1217
9	2.5	99.2	101.7	9.7	.70	.126	590	61.8	7.6	.70	17.9	82.2	85.6	23.05	.1231
10	2.2	90.1	92.3	9.0	.65	.106	550	57.6	7.3	.67	15.8	76.1	89.4	27.15	.1224
11	1.4	81.1	82.5	7.3	.53	.377	515	54.0	7.2	.65	11.8	62.2	91.0	32.14	.1068
12															
13															

T2

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 3
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7⁄4 IN.
DATE 4-12-15.

DISCH. DIAM. 7.0 IN.
DISCH. AREA .267 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	15.2	371.8	387.0	23.8	1.71	1.18	1220	128.0	32.3	3.80	31.0	148.4	76.2	14.13	.1463
2	13.7	307.3	321.0	22.6	1.62	.92	1100	115.4	24.3	2.83	32.7	140.8	78.0	14.34	.1538
3	13.0	253.0	266.0	22.1	1.59	.75	980	102.8	19.2	2.17	34.5	137.5	73.8	15.57	.1688
4	12.3	216.7	229.0	21.4	1.53	.63	920	96.5	15.8	1.75	35.8	133.7	79.3	15.17	.1747
5	10.5	180.5	191.0	19.8	1.42	.48	845	88.5	13.2	1.41	34.2	123.3	78.8	15.77	.1756
6	8.7	144.3	153.0	17.9	1.29	.35	770	80.7	11.1	1.15	30.5	111.8	75.9	17.03	.1748
7	7.3	126.2	133.5	16.5	1.18	.28	700	73.4	9.5	.95	29.6	102.8	79.8	18.71	.1767
8	6.1	108.4	114.5	15.1	1.08	.22	640	67.1	8.7	.83	26.7	94.3	82.0	21.38	.1773
9	5.4	90.4	95.8	14.2	1.02	.17	595	62.4	8.0	.75	23.2	88.6	79.3	24.05	.1792
10	4.7	81.3	86.0	13.2	.95	.15	550	57.6	7.7	.73	20.1	82.5	83.4	29.41	.1808
11	4.0	72.2	76.2	12.2	.88	.12	510	53.5	7.8	.74	16.0	75.8	86.1	37.70	.1793
12															
13															

K_3

TEST OF CENTRIFUGAL BLOWER

RUNNER No 3
No. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT
WIDTH RUNNER 7.4 IN.
DATE 4-12-15.

DISCH. DIAM. 8.0 IN.
DISCH. AREA .349 SQ.FT.
INLET AREA .785 SQ.FT.

RUN No	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	34.3	244	378	35.8	2.56	1.73	1260	132	39.5	4.60	37.6	171	69.8	15.53	.2131
2	27.8	280	308	32.3	2.21	1.27	1130	118	29.5	3.42	37.1	154	70.6	15.97	.2146
3	23.1	226	249	29.4	2.11	.93	1010	106	22.6	2.60	35.9	140	71.6	17.00	.2185
4	18.8	189	208	26.5	1.90	.71	930	97	18.0	2.02	34.9	127	70.8	16.98	.2140
5	15.9	162	178	24.4	1.75	.55	845	88	14.8	1.62	34.2	116	73.4	18.13	.2167
6	13.0	135	148	22.1	1.58	.42	775	81	12.3	1.30	32.2	105	72.5	18.86	.2136
7	10.5	108	119	19.8	1.42	.30	700	73	10.3	1.05	28.6	91	71.3	20.67	.2125
8	8.7	99	108	18.0	1.29	.25	645	68	9.1	.89	21.8	86	78.0	22.38	.2090
9	7.6	81	89	16.9	1.21	.19	600	63	8.5	.82	23.4	80	72.3	25.61	.2107
10	6.5	72	79	15.5	1.11	.16	555	58	8.0	.75	20.8	74	74.9	29.62	.2090
11	5.4	63	68	14.2	1.02	.12	515	54	8.0	.75	16.6	68	75.7	37.08	.2074
12															
13															

K4

TEST OF CENTRIFUGAL BLOWER

Runner No. 3
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.4 In.
Date 4-12-15.

Disch. Diam. 9.0 In.
Disch. Area .442 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec	Lbs Air Moved/Sec	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps. Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	Kp	Kc
1	52.7	293	346	44.0	3.14	1.96	1275	134	49.0	5.54	35.4	167	62.2	18.06	.2610
2	43.0	253	296	40.1	2.86	1.53	1140	120	37.5	4.38	34.5	151	65.6	19.96	.2640
3	34.7	202	237	36.1	2.58	1.09	1025	107	26.3	3.09	35.4	136	66.6	19.40	.2640
4	29.3	172	201	33.1	2.36	.85	940	98	20.7	2.36	35.9	125	66.8	19.17	.2640
5	23.5	140	163	29.6	2.12	.62	850	89	16.5	1.88	32.9	112	66.2	20.68	.2618
6	19.5	117	137	27.0	1.93	.47	770	81	13.7	1.47	32.0	102	67.8	21.83	.2630
7	15.9	101	117	24.4	1.74	.36	700	73	11.3	1.18	30.9	92	69.6	23.22	.2617
8	13.0	90	103	22.1	1.58	.29	645	68	9.9	.99	29.4	83	73.7	24.91	.2567
9	11.2	72	83	20.5	1.47	.22	590	62	9.0	.88	24.8	77	70.6	28.95	.260
10	9.4	69	78	18.7	1.34	.19	545	57	8.3	.79	23.7	71	74.9	32.95	.2574
11	8.0	64	72	17.2	1.23	.16	520	54	8.3	.79	20.1	65	79.0	37.95	.2490
12															
13															

K6

TEST OF CENTRIFUGAL BLOWER

RUNNER No. 3
No. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-12-15.

DISCH. DIAM. 10.0 IN.
DISCH. AREA .547 SQ. FT.
INLET AREA .785 SQ. FT.

RUN No	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	78.1	218	296	54.3	3.88	2.05	1215	126	53.0	5.91	34.1	165	58.7	22.23	.3356
2	69.7	199	269	51.0	3.64	1.75	1145	120	43.3	5.00	35.0	155	60.2	22.46	.3343
3	55.2	155	210	45.5	3.25	1.21	1010	106	30.0	3.53	34.5	138	60.2	23.32	.3377
4	43.9	127	171	40.6	2.90	.88	925	97	22.9	2.64	33.5	123	58.5	22.50	.3292
5	36.3	110	146	36.8	2.63	.68	840	88	18.2	2.05	33.4	112	60.6	23.35	.3290
6	31.3	91	122	34.2	2.44	.53	770	81	15.3	1.68	31.8	104	60.6	24.90	.3330
7	25.1	73	98	30.6	2.18	.38	700	73	12.5	1.32	28.9	93	58.4	26.00	.3280
8	20.3	68	88	27.5	1.96	.31	640	67	10.8	1.17	26.5	84	63.5	30.13	.3230
9	17.5	59	76	25.6	1.83	.25	595	62	9.6	.95	26.0	78	63.2	30.50	.3230
10	14.9	54	69	23.6	1.69	.21	545	57	8.9	.87	24.0	72	68.4	36.30	.3244
11	12.3	46	58	21.5	1.54	.16	510	54	8.8	.85	18.7	66	65.3	43.30	.3166
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 3
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7¼ IN.
DATE 4-12-15.

DISCH. DIAM. 11.0 IN.
DISCH. AREA .66 SQ.FT.
INLET AREA .785 SQ.FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	104	127	231	62.3	4.50	1.83	1180	124	57.0	6.27	29.3	157	45.0	25.74	.396
2	95	109	204	59.5	4.25	1.55	1130	119	48.8	5.52	28.1	150	46.8	25.80	.395
3	77	95	172	53.8	3.84	1.18	1020	107	36.2	4.23	27.8	136	48.2	26.92	.396
4	65	82	147	49.5	3.53	.93	940	98	28.4	3.33	27.9	125	48.8	27.07	.395
5	53	73	126	44.7	3.19	.71	845	89	21.3	2.40	29.8	113	51.7	26.87	.397
6	44	58	102	40.8	2.91	.53	765	80	17.1	1.90	28.1	103	51.3	28.64	.400
7	36	45	81	36.9	2.64	.38	685	72	13.7	.48	25.6	93	50.4	31.10	.404
8	31	36	67	33.8	2.41	.28	640	67	12.0	1.25	22.7	85	47.8	32.20	.397
9	26	36	62	31.3	2.24	.25	600	63	10.7	1.10	22.6	79	51.2	34.35	.392
10	22	37	59	29.6	2.11	.22	550	58	9.8	.98	22.8	75	57.3	39.77	.404
11	20	27	47	25.7	1.84	.15	515	54	9.3	.91	16.9	69	51.8	45.00	.374
12															
13															

TEST OF CENTRIFUGAL BLOWER

Runner No. 3
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.4 In.
Date 4-12-15.

Disch. Diam. 11.8 In.
Disch. Area .76 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No.	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	Kp	Kc
1	129	36	165	69.4	4.95	1.48	1140	119	60.7	6.57	22.6	152	37.3	29.94	.454
2	117	36	153	66.1	4.71	1.31	1100	115	51.4	5.76	22.8	145	36.3	29.22	.451
3	99	36	135	60.8	4.33	1.06	1010	106	39.3	4.60	23.1	133	38.9	30.11	.452
4	86	42	128	56.6	4.03	.94	940	98	30.9	3.63	26.0	124	42.7	29.50	.452
5	70	29	99	51.0	3.64	.65	850	89	23.3	2.70	24.2	112	40.2	29.70	.451
6	58	27	85	46.5	3.32	.51	770	81	18.7	2.10	24.4	102	41.9	31.07	.453
7	44	18	62	40.6	2.99	.33	695	73	15.0	1.65	19.8	89	37.9	33.20	.438
8	41	18	59	39.1	2.79	.30	635	66	12.8	1.36	21.9	86	43.2	35.86	.462
9	35	18	53	36.1	2.58	.25	590	62	11.2	1.16	21.2	79	44.6	38.12	.458
10	30	18	48	33.4	2.38	.21	540	57	10.3	1.05	19.6	73	47.8	45.00	.464
11	25	18	43	30.8	2.20	.17	515	54	9.8	.98	17.7	68	47.8	48.40	.450
12															
13															

K8

O" Orifice			
R.P.M. Of Blower	Amps Input	Vel Hd. In. Water	Stat. Hd
762	5.7	0	1.5
646	5.3	0	1.
640	5.2	0	1.3
591	5.2	0	.9
550	5.2	0	.8
504	5.3	0	.
		0	
		0	
		0	
		0	
		0	
		0	

TEST OF CENTRIFUGAL BLOWER

RUNNING LOG

RUNNER No. 4

DATE 4-19-15

VOLTS 110

TEMPERATURE WET BULB 57.2°F.

TEMPERATURE DRY BULB 67.2°F.

BAROMETER 29.276

REL HUM'TY. 34 %

0" ORIFICE				6" ORIFICE				7" ORIFICE				8" ORIFICE				9" ORIFICE				10" ORIFICE				11" ORIFICE				11.8" ORIFICE			
R.P.M. OF BLOWER	AMPS INPUT	VEL. HD IN. WATER	STAT. HD IN WATER	R.P.M. OF BLOWER	AMPS INPUT	VEL. HD IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD IN. WATER	STAT. HD IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD IN. WATER	R.P.M. OF BLOWER	AMPS INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD. IN. WATER	STAT. HD. IN. WATER	R.P.M. OF BLOWER	AMPS. INPUT	VEL. HD IN. WATER	STAT. HD IN. WATER
[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	.040	1.500	[illegible]	8.9	.080	1.625	995	11.5	.170	1.750	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.900	[illegible]	13.5	.480	.500	[illegible]	13.8	.530	[illegible]
[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	1.125	833	7.7	.070	1.375	916	9.8	.145	1.500	[illegible]	10.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.875	907	11.5	.405	.467	[illegible]	11.7	[illegible]	[illegible]
[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	.025	1.063	[illegible]	[illegible]	.055	1.200	836	8.5	[illegible]	[illegible]	838	8.8	.135	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.6	[illegible]	[illegible]	[illegible]	9.9	[illegible]	.280
[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	.020	1.000	690	[illegible]	.040	1.000	761	7.4	.095	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	758	8.2	[illegible]	.300	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	.875	638	5.8	.035	.875	[illegible]	[illegible]	.080	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.500	680	7.2	[illegible]	[illegible]	685	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	.750	590	5.7	.030	.750	540	6.2	.065	.750	640	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.7	[illegible]	[illegible]	[illegible]	6.8	[illegible]	[illegible]
		0		[illegible]	[illegible]	.010	[illegible]	545	5.1	.020	.625	520	5.2	.055	[illegible]	590	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	525	6.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		0						503	5.3	[illegible]	.600	541	5.8	[illegible]	[illegible]	545	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.300	[illegible]	[illegible]	.140	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		0										525	[illegible]	[illegible]	[illegible]	508	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	505	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		0																													
		0																													
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TEST OF CENTRIFUGAL BLOWER

Runner No. 4
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.4 In.
Date 4-19-15.

Disch. Diam. 0.0 In.
Disch. Area .00 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	K_p	K_c
1	0	112.0	112.0	0	0	0	762	79.6	5.7	.45	0	0	57.4	6.87	0
2	0	93.3	93.3	0	0	0	696	72.8	5.3	.42	0	0	56.7	8.42	0
3	0	79.3	79.3	0	0	0	640	66.9	5.2	.40	0	0	57.1	10.32	0
4	0	70.0	70.0	0	0	0	591	61.8	5.2	.40	0	0	59.0	13.10	0
5	0	59.7	59.7	0	0	0	550	57.5	5.2	.40	0	0	58.5	16.23	0
6	0	56.1	56.1	0	0	0	509	53.2	5.5	.43	0	0	63.7	22.03	0
7															
8															
9															
10															
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 4
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-19-15.

DISCH. DIAM. 6.0 IN.
DISCH. AREA .196 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	2.99	112.3	115.3	10.6	.74	.133	837	87.6	7.4	.675	19.8	89.7	48.6	7.78	.0948
2	2.77	84.1	86.9	10.2	.7	.11	764	80.0	6.6	.575	19.4	86.2	49.7	8.71	.0998
3	1.87	79.5	81.4	8.4	.58	.086	695	72.7	6.1	.520	16.5	70.9	49.9	10.46	.0903
4	1.50	74.8	76.3	7.5	.52	.072	640	66.9	5.7	.450	16.0	63.5	54.1	11.59	.0876
5	1.42	65.4	66.8	7.3	.5	.061	590	61.7	5.6	.440	14.0	61.8	56.7	14.48	.0927
6	1.12	56.2	57.3	6.5	.45	.047	548	57.4	5.6	.440	10.6	54.9	55.9	18.04	.0887
7	.75	46.7	47.5	5.3	.37	.032	508	53.2	5.8	.480	6.6	44.8	54.3	24.72	.0779
8															
9															
10															
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 4
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.4 IN.
DATE 4-19-15.

DISCH. DIAM. 7.0 IN.
DISCH. AREA .267 SQ.FT.
INLET AREA .785 SQ.FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU.FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	Kp	Kc
1	5.97	121.3	127.3	14.9	1.03	.240	910	95.2	8.8	.86	27.9	93.1	45.3	7.70	.1233
2	5.23	102.6	107.8	14.0	.97	.190	833	87.2	7.7	.72	25.3	87.1	45.7	8.42	.1257
3	4.11	89.6	93.7	12.4	.86	.147	762	79.8	6.8	.61	24.0	77.2	47.4	9.31	.1219
4	2.99	74.7	77.7	10.6	.74	.104	690	72.2	6.3	.55	18.9	65.8	48.0	11.30	.1148
5	2.62	65.3	67.9	9.9	.69	.085	638	66.8	5.8	.48	17.6	57.1	49.1	12.48	.1163
6	2.24	56.0	58.2	9.2	.64	.067	590	61.7	5.7	.46	14.6	46.5	49.5	15.13	.1163
7	1.49	46.7	48.2	7.5	.52	.045	548	57.4	5.7	.46	9.9	45.4	47.1	18.87	.1022
8	1.42	44.8	46.2	7.3	.51	.042	509	53.3	5.9	.49	8.7	45.2	52.4	25.10	.1073
9															
10															
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

Runner No. 4	Diam. Runner 2 Ft.	Disch. Diam. 8.0 In.
No. Blades 35	Width Runner 7.44 In.	Disch. Area .349 Sq. Ft.
Volts 110	Date 4-19-15.	Inlet Area .785 Sq. Ft.

Run No.	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs. Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps. Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	K_p	K_c
1	12.7	130.7	143.4	21.8	1.51	.394	995	104.2	11.5	1.20	32.9	104.0	42.7	8.23	.1642
2	10.8	112.0	122.8	20.1	1.39	.311	916	95.9	9.8	.98	31.8	96.0	43.0	8.61	.1646
3	9.0	93.3	102.3	18.3	1.27	.237	836	87.5	8.5	.82	28.7	87.5	43.4	9.53	.1643
4	7.1	80.3	87.4	16.3	1.13	.179	767	80.3	7.4	.68	26.4	77.7	43.6	10.18	.1592
5	6.0	65.3	71.3	14.9	1.03	.134	698	73.1	6.6	.58	23.2	71.3	43.0	11.52	.1605
6	4.9	55.9	60.8	13.5	.94	.104	640	67.0	6.2	.52	19.8	64.3	43.7	13.52	.1581
7	4.1	46.7	50.8	12.4	.86	.079	590	61.7	5.9	.48	16.5	59.2	43.0	15.78	.1576
8	3.4	41.9	45.3	11.2	.78	.064	547	57.2	5.8	.47	13.5	53.5	44.7	19.60	.1537
9	3.0	37.3	40.3	10.6	.74	.054	505	52.8	6.1	.51	10.6	50.4	46.7	26.72	.1568
10															
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER No. 4	DIAM. RUNNER 2 FT.	DISCH. DIAM. 9.0 IN.
No. BLADES 35	WIDTH RUNNER 744 IN.	DISCH. AREA .442 SQ. FT.
VOLTS 110	DATE 4-19-15.	INLET AREA .785 SQ. FT.

RUN No	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	20.9	103.0	123.9	28.0	1.94	.437	1000	104.7	12.3	1.30	33.6	105.4	36.5	8.77	.2097
2	17.2	89.8	107.0	25.4	1.76	.342	916	95.9	10.3	1.05	32.6	95.5	37.5	9.22	.2075
3	14.6	74.9	89.5	23.3	1.62	.263	838	87.7	8.8	.86	30.6	87.9	37.7	9.87	.2087
4	12.0	65.5	77.5	21.2	1.47	.207	762	79.7	7.7	.70	29.6	79.7	39.3	10.69	.2084
5	9.7	56.1	65.8	19.0	1.32	.158	692	72.4	6.8	.61	25.9	71.7	39.3	12.42	.2068
6	8.2	46.8	55.0	17.6	1.22	.122	640	67.0	6.3	.55	22.1	66.0	39.5	14.6	.2059
7	6.7	37.5	44.2	15.9	1.10	.088	590	61.7	6.1	.51	17.3	59.6	37.5	16.76	.2015
8	6.0	32.7	38.7	14.9	1.03	.073	548	57.4	6.0	.50	14.6	56.3	37.8	20.53	.2048
9	4.9	28.0	32.9	13.5	.94	.056	508	53.2	6.2	.52	10.7	50.8	37.5	27.06	.1994
10															
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

RUNNER No. 4
No. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.44 IN.
DATE 4-19-15.

DISCH. DIAM. 10.0 IN.
DISCH. AREA .547 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	26.6	67.4	94.0	31.5	2.18	.374	998	104.5	12.8	1.37	27.3	96.0	27.7	9.31	.237
2	22.1	65.6	87.7	28.7	1.99	.317	912	95.4	10.6	1.08	29.4	87.4	31.1	9.64	.236
3	18.4	56.1	74.5	26.2	1.81	.246	837	87.6	9.2	.90	27.4	79.7	31.3	10.37	.236
4	15.3	46.9	62.2	23.9	1.66	.187	762	79.8	8.1	.76	24.7	72.8	31.4	11.60	.235
5	12.7	37.5	50.2	21.8	1.51	.138	690	72.2	7.0	.62	22.1	66.3	31.0	12.85	.237
6	10.5	32.8	43.3	19.8	1.37	.108	638	66.8	6.5	.56	19.3	60.2	31.3	14.51	.233
7	9.0	28.1	37.1	18.3	1.27	.085	588	61.5	6.2	.53	16.1	55.7	31.8	17.62	.234
8	7.5	22.5	30.0	16.7	1.16	.063	548	57.4	6.1	.51	12.4	50.8	29.3	20.92	.229
9	6.4	18.7	25.1	15.4	1.07	.049	505	52.8	6.3	.55	8.9	46.9	29.1	22.83	.229
10															
11															
12															
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TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 4
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.44 IN.
DATE 4-19-15.

DISCH. DIAM. 11.0 IN.
DISCH. AREA .66 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	36.0	37.4	73.4	36.7	2.54	.340	1000	104.7	13.6	1.45	23.4	92.5	21.6	9.79	.275
2	30.3	32.8	63.1	33.6	2.33	.267	907	94.9	11.3	1.18	22.7	84.5	22.6	10.67	.278
3	25.5	28.1	53.6	30.9	2.14	.209	832	87.1	9.6	.95	22.0	78.1	22.7	11.13	.279
4	21.0	22.4	43.4	28.0	1.94	.153	758	79.4	8.2	.78	19.6	70.6	22.2	12.08	.277
5	17.6	18.7	36.3	25.7	1.78	.114	690	72.2	7.2	.67	17.1	64.7	21.8	13.76	.279
6	14.6	15.0	29.6	23.3	1.61	.087	636	66.6	6.7	.58	15.0	58.9	21.5	15.23	.275
7	13.5	12.7	26.2	21.1	1.46	.070	595	62.3	6.4	.55	12.7	55.8	21.7	17.63	.267
8	10.5	9.4	19.9	19.8	1.37	.050	542	56.7	6.2	.52	9.5	50.0	20.0	22.27	.274
9	9.0	7.5	16.5	18.3	1.27	.038	505	52.8	6.3	.53	7.2	46.2	19.1	27.80	.272
10															
11															
12															
13															

TEST OF CENTRIFUGAL BLOWER

Runner No. 4
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.44 In.
Date 4-19-15.

Disch. Diam. 11.8 In.
Disch. Area .76 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips Ft./Sec.	Amps Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice Ft./Sec.	Man. Eff. Of Blower	K_p	K_c
1	44.2	9.4	53.6	40.6	2.81	.274	900	103.7	15.8	1.45	18.5	89.0	16.05	10.30	.3016
2	37.5	9.3	46.8	37.4	2.59	.221	906	94.8	11.7	1.22	18.1	81.5	11.80	11.68	.3043
3	30.7	6.0	36.7	33.8	2.34	.156	830	86.9	9.8	.98	15.5	74.2	14.60	12.58	.3060
4	26.2	4.7	30.9	31.3	2.17	.123	753	78.8	8.5	.82	14.9	68.6	16.00	13.01	.3114
5	17.2	2.9	20.1	25.3	1.75	.064	688	72.0	7.3	.61	9.6	55.4	12.50	13.88	.2758
6	16.8	1.5	18.3	25.0	1.73	.058	630	65.9	6.8	.60	9.6	54.8	13.50	16.20	.2975
7	16.5	.8	17.3	24.8	1.72	.054	583	61.0	6.4	.55	9.5	54.4	14.90	15.13	.3190
8	13.1	.8	13.9	22.1	1.53	.039	540	56.5	6.3	.54	7.2	45.5	14.10	23.14	.3070
9	11.3	.7	12.0	20.3	1.40	.031	502	52.5	6.4	.55	5.6	44.5	14.00	29.34	.3060
10															
11															
12															
13															

O" Orifice

R.P.M. Of Blower	Amps. Input	Vel. Hd. In. Water	Stat. Hd. In Water
1225	18.4	0	6.0
1102	13.9	0	5.0
995	11.3	0	4.0
918	9.6	0	3.375
842	8.3	0	2.875
767	7.2	0	2.250
700	6.5	0	2.00
648	6.1	0	1.625
594	5.8	0	1.375
548	5.8	0	1.125
510	6.0	0	1.000
		0	
		0	

TEST OF CENTRIFUGAL BLOWER

Running Log

Runner No. 5.

Date 4-21-15.
Volts 110

Temperature Wet Bulb 73.0°F.
Temperature Dry Bulb 87.2°F.

Barometer 29.46
Rel. Hum'ty. 50. %

0" Orifice				6" Orifice			
R.P.M. Of Blower	Amps Input	Vel Hd In. Water	Stat. Hd In Water	R.P.M. Of Blower	Amps Input	Vel. Hd. In. Water	Stat. Hd. In Water
1225	18.4	0	6.0	1220	24.7	.16	5.00
1102	13.9	0	5.0	1106	19.0	.13	4.0625
995	11.3	0	4.0	998	14.8	.11	3.375
918	9.6	0	3.375	918	12.3	.09	2.875
842	8.3	0	2.875	840	10.3	.075	2.375
767	7.2	0	2.250	768	8.8	.06	2.00
700	6.5	0	2.00	692	7.6	.055	1.625
648	6.1	0	1.625	640	7.0	.045	1.375
594	5.8	0	1.375	588	6.5	.035	1.125
548	5.8	0	1.125	543	6.4	.03	1.00
510	6.0	0	1.000	505	6.5	.025	.875
		0					
		0					

7" Orifice				8" Orifice			
R.P.M. Of Blower	Amps. Input	Vel Hd In Water	Stat Hd In Water	R.P.M. Of Blower	Amps. Input	Vel Hd In. Water	Stat Hd In Water
1223	29.5	.295	4.75	1225	34.8	.48	4.375
1112	22.0	.24	3.9375	1113	25.8	.395	3.50
1000	17.1	.20	3.125	1002	19.8	.325	3.00
921	14.0	.165	2.625	922	15.8	.275	2.50
840	11.5	.14	2.25	843	12.9	.225	2.00
765	9.7	.12	1.875	770	10.7	.19	1.625
697	8.3	.10	1.500	700	9.1	.155	1.375
638	7.5	.08	1.250	638	8.1	.135	1.125
594	6.9	.07	1.000	592	7.4	.115	1.000
544	6.6	.06	1.000	553	7.1	.105	.875
505	6.7	.05	.84	512	7.0	.085	.750

9" Orifice				10" Orifice			
R.P.M. Of Blower	Amps. Input	Vel. Hd In. Water	Stat. Hd. In. Water	R.P.M. Of Blower	Amps. Input	Vel. Hd. In Water	Stat Hd In Water
1220	41.7	.765	3.75	1214	46.3	1.075	2.75
1122	31.6	.64	3.125	1130	37.2	.93	2.375
1010	24.1	.525	2.625	1013	27.0	.75	1.9375
926	19.0	.44	2.25	928	21.2	.635	1.60
843	15.2	.375	1.80	845	16.7	.53	1.25
768	12.3	.305	1.50	764	13.6	.435	1.00
697	10.1	.245	1.125	693	10.9	.36	.9375
640	8.8	.210	1.000	638	9.6	.305	.750
590	8.1	.18	.9375	588	8.7	.26	.625
546	7.7	.155	.750	545	8.1	.22	.500
508	7.5	.13	.625	507	7.8	.19	.500

11" Orifice				11.8" Orifice			
R.P.M. Of Blower	Amps. Input	Vel. Hd. In. Water	Stat. Hd. In Water	R.P.M. Of Blower	Amps. Input	Vel. Hd In Water	Stat Hd In Water
1208	47.1	1.275	1.375	1210	47.8	1.50	.375
1127	37.8	1.115	1.250	1128	38.4	1.325	.340
1013	27.6	.905	1.000	1014	28.1	1.07	.250
928	21.6	.765	.875	930	22.1	.90	.22
844	17.2	.635	.750	844	17.0	.75	.125
767	13.7	.530	.500	767	13.9	.635	.125
690	11.3	.440	.500	693	11.2	.510	.100
638	9.8	.375	.400	638	9.8	.440	.075
590	8.7	.320	.375	588	8.7	.370	.05
545	8.1	.275	.250	543	8.1	.320	.05
508	7.8	.235	.200	507	7.8	.275	.02

TEST OF CENTRIFUGAL BLOWER

Runner No 5
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.41 In.
Date 4-21-15.

Disch. Diam. 0.0 In.
Disch. Area 0.0 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No.	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs. Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps. Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	K_p	K_c
1	0	440	440	0	0	0	1225	128.6	18.4	2.07	0	0	85.7	7.62	0
2	0	367	367	0	0	0	1102	105.7	13.9	1.49	0	0	99.9	7.52	0
3	0	294	294	0	0	0	995	104.1	11.3	1.18	0	0	87.4	8.07	0
4	0	248	248	0	0	0	918	96.2	9.6	.96	0	0	86.5	8.38	0
5	0	211	211	0	0	0	842	88.2	8.3	.80	0	0	87.2	9.05	0
6	0	165	165	0	0	0	767	80.4	7.2	.65	0	0	82.2	9.70	0
7	0	147	147	0	0	0	700	73.4	6.5	.56	0	0	88.0	11.00	0
8	0	119.4	119.4	0	0	0	648	67.9	6.1	.52	0	0	83.4	12.9	0
9	0	101.	101.	0	0	0	594	62.1	5.8	.48	0	0	84.4	15.48	0
10	0	82.6	82.6	0	0	0	548	57.4	5.8	.48	0	0	80.9	19.7	0
11	0	73.5	73.5	0	0	0	510	53.45	6.0	.50	0	0	82.6	25.45	0
12															
13															

M,

TEST OF CENTRIFUGAL BLOWER

RUNNER No. 5
No. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.41 IN.
DATE 4-21-15.

DISCH. DIAM. 6.0 IN.
DISCH. AREA .196 SQ. FT.
INLET AREA .785 SQ. FT.

RUN No	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	11.77	367.2	379	20.9	1.475	1.018	1220	128	24.7	2.875	35.4	178.5	74.5	10.69	.1284
2	9.56	298.4	308	18.87	1.33	.746	1106	116	19.0	2.150	34.7	160.	73.8	10.71	.1278
3	8.09	247.9	256	17.38	1.225	.570	998	104.6	14.8	1.60	35.6	148.	75.4	10.87	.1304
4	6.61	211.4	218	15.70	1.11	.439	918	96.1	12.3	1.30	33.8	134.	76.0	11.32	.128
5	5.51	174.5	180	14.35	1.01	.332	840	88.	10.3	1.05	31.6	122	74.8	11.95	.128
6	4.41	147.1	151.5	12.82	.906	.250	768	80.5	8.8	.85	29.4	109	75.2	12.65	.125
7	4.04	119.5	123.5	12.27	.865	.1945	692	72.5	7.6	.70	27.8	104	75.6	14.25	.1328
8	3.31	101.0	104.3	11.10	.785	.149	640	67.0	7.0	.625	24.8	94.5	74.8	16.10	.130
9	2.57	82.73	85.3	9.80	.691	.107	588	61.6	6.5	.55	19.5	83.5	72.5	18.31	.125
10	2.205	73.6	75.8	9.08	.640	.0884	543	56.9	6.4	.54	16.4	77.0	75.4	22.75	.125
11	1.84	64.26	66.1	8.31	.586	.0705	505	52.9	6.5	.55	12.8	70.5	76.2	28.80	.1235
12															
13															

M3

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 5
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.41 IN.
DATE 4-21-15.

DISCH. DIAM. 7.0 IN.
DISCH. AREA .2672 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	21.65	248.85	270.5	28.5	2.01	1.356	1223	128.5	29.5	3.475	39.	204.	72.3	12.81	.175
2	17.64	289.36	307.	25.7	1.815	1.012	1112	116.8	22.	2.525	40.1	183.5	72.4	12.4	.172
3	14.70	229.3	244	23.4	1.65	.732	1000	105.	17.1	1.90	38.6	167	71.1	12.81	.1758
4	12.10	192.9	205.	21.2	1.495	.558	921	96.5	14.	1.50	37.2	152	70.7	12.95	.1728
5	10.3	165.5	175.8	19.62	1.385	.443	840	88.0	11.5	1.20	36.9	140.	72.4	13.68	.1748
6	8.82	137.68	146.5	18.16	1.280	.342	765	80.2	9.7	.975	35.1	130.	72.5	14.70	.1768
7	7.35	110.15	117.5	16.58	1.170	.250	697	73.	8.3	.775	32.3	118	70.4	15.48	.1775
8	5.88	91.82	97.7	14.80	1.044	.186	638	66.9	7.5	.70	26.6	106	70.5	18.2	.174
9	5.15	73.45	78.6	13.90	.980	.1405	594	62.2	6.9	.60	23.4	98.8	65.8	19.32	.176
10	4.40	73.5	77.9	12.82	.905	.1285	544	57.	6.6	.575	22.35	91.75	74.5	24.1	.174
11	3.68	65.32	69.0	11.71	.828	.1039	505	52.9	6.7	.576	18.4	83.5	77.0	30.2	.174
12															
13															

TEST OF CENTRIFUGAL BLOWER

Runner No. 5
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.41 In.
Date 4-21-15.

Disch. Diam. 8.0 In.
Disch. Area .349 Sq.Ft.
Inlet Area .785 Sq.Ft.

Run No	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs. Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps. Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	K_p	K_c
1	35.3	321.7	357	36.4	2.56	1.661	1225	128.6	34.8	4.075	40.8	174.	69.5	15.	.2225
2	29.1	257.4	286.5	33.	2.32	1.31	1113	116.9	25.8	3.00	40.4	157.5	67.6	14.6	.222
3	23.9	221.1	245.	29.82	2.10	.936	1002	105.2	19.8	2.25	41.6	143.	71.2	15.2	.2235
4	20.25	183.75	204.	27.5	1.935	.719	922	96.6	15.8	1.725	41.7	131.5	70.4	14.9	.2235
5	16.55	147.45	164.	24.9	1.75	.523	843	88.4	12.9	1.375	38.05	119.	67.6	15.48	.222
6	14.0	119.7	133.7	22.9	1.610	.393	770	80.7	10.7	1.08	36.4	109.4	66.	15.95	.2225
7	11.4	101.2	112.6	20.6	1.450	.298	700	73.4	9.1	.90	33.1	98.9	67.4	17.70	.221
8	9.93	83.57	93.5	19.28	1.36	.231	638	66.8	8.1	.775	29.8	92	67.4	20.2	.226
9	8.46	73.54	82.	17.8	1.25	.1875	592	62.	7.4	.675	27.8	85	68.6	22.	.2255
10	7.73	64.47	72.2	17.0	1.20	.157	553	58.	7.1	.650	24.2	81.5	69.1	25.9	.230
11	6.25	55.25	61.5	15.28	1.075	.120	512	53.7	7.0	.625	19.2	73.0	68.8	31.45	.224
12															
13															

M4

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 5
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.41 IN.
DATE 4-21-15.

DISCH. DIAM. 9.0 IN.
DISCH. AREA .443 SQ. FT.
INLET AREA .785 SQ. FT.

RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	56.4	276.6	333.	46.	3.24	1.96	1220	128.	41.7	4.825	40.6	173.	65.5	17.92	.283
2	47.1	230.9	278.	42	2.95	1.49	1122	117.9	31.6	3.70	40.2	157.5	64.5	17.68	.280
3	38.7	193.3	232	38.	2.67	1.125	1010	105.9	24.1	2.80	40.2	143.	66.5	18.90	.282
4	32.4	165.6	198.	34.8	2.45	.88	926	97.	19.0	2.15	41.0	131.	67.6	18.3	.282
5	27.65	132.35	160	32.2	2.26	.658	843	88.4	15.2	1.675	39.3	121.	65.9	18.9	.286
6	22.5	110.5	133	29.	2.04	.492	768	80.5	12.3	1.30	37.8	109.	66.9	19.37	.283
7	18.05	82.95	101	26	1.83	.336	697	73.	10.1	1.025	32.8	97.8	61.7	20.4	.280
8	15.5	73.7	89.2	24.05	1.69	.274	640	67	8.8	.85	32.5	90.4	64.6	21.9	.282
9	13.28	69.12	82.4	22.3	1.57	.2345	540	61.8	8.1	.75	31.3	83.8	69.5	24.65	.284
10	11.4	55.3	66.7	20.6	1.45	.1755	546	57.25	7.7	.70	25.4	77.8	65.5	29.0	.283
11	9.58	46.02	55.6	18.9	1.33	.1342	508	53.2	7.5	.675	19.9	71.25	63.4	34.8	.279
12															
13															

TEST OF CENTRIFUGAL BLOWER

Runner No. 5
No. Blades 35
Volts 110

Diam. Runner 2 Ft.
Width Runner 7.41 In.
Date 4-21-15.

Disch. Diam. 10.0 In.
Disch. Area .545 Sq. Ft.
Inlet Area .785 Sq. Ft.

Run No.	Velocity Hd. Ft. Of Air	Static Hd. Ft. Of Air	Total Hd. Ft. Of Air	Cu. Ft. Air Moved/Sec.	Lbs. Air Moved/Sec.	Work Done By Blower H.P.	R.P.M. Of Blower	Lin. Vel. Of Blade Tips	Amps. Input To Motor	H.P. Supplied To Motor	Mech. Eff. Of Blower	Vel. Air Thru Eff. Orifice	Man. Eff. Of Blower	K_p	K_c
1	79.3	202.7	282	54.4	3.82	1.96	1214	127.3	46.3	5.275	37.2	166.5	56.1	19.9	.335
2	68.6	175.4	244	50.6	3.56	1.58	1130	118.5	37.2	4.35	36.4	155.	55.9	20.3	.336
3	55.3	142.7	198	45.5	3.20	1.15	1013	106.2	27.0	3.175	36.2	139.	56.5	20.6	.3365
4	46.8	118.	164.8	41.8	2.93	.88	928	97.3	21.2	2.45	35.9	128.	56.0	20.7	.3375
5	39.1	91.9	131.	38.2	2.68	.64	845	88.5	16.7	1.85	34.6	117.	53.8	20.7	.3385
6	32.1	73.7	105.8	34.6	2.43	.477	764	80.0	13.6	1.45	32.9	105.8	53.1	21.9	.340
7	26.6	69.0	95.6	31.5	2.21	.385	693	72.6	10.9	1.10	35.0	96.4	58.5	22.3	.341
8	22.5	55.3	77.8	29.0	2.04	.288	683	66.8	9.6	.95	30.35	88.7	56.2	24.7	.341
9	19.2	46.1	65.3	26.8	1.88	.223	588	61.6	8.7	.825	27.1	81.75	55.5	27.4	.341
10	16.22	36.88	53.1	24.6	1.73	.167	545	57.1	8.1	.77	21.7	75.3	52.4	32.2	.339
11	14.0	36.9	50.9	22.9	1.61	.149	507	53.1	7.8	.725	20.6	70.0	58.1	37.5	.3385
12															
13															

M6

M7

TEST OF CENTRIFUGAL BLOWER

RUNNER NO. 5.
NO. BLADES 35
VOLTS 110

DIAM. RUNNER 2 FT.
WIDTH RUNNER 7.41 IN.
DATE 4-21-15.

DISCH. DIAM. 11.0 IN.
DISCH. AREA .660 SQ. FT.
INLET AREA .785 SQ. FT.

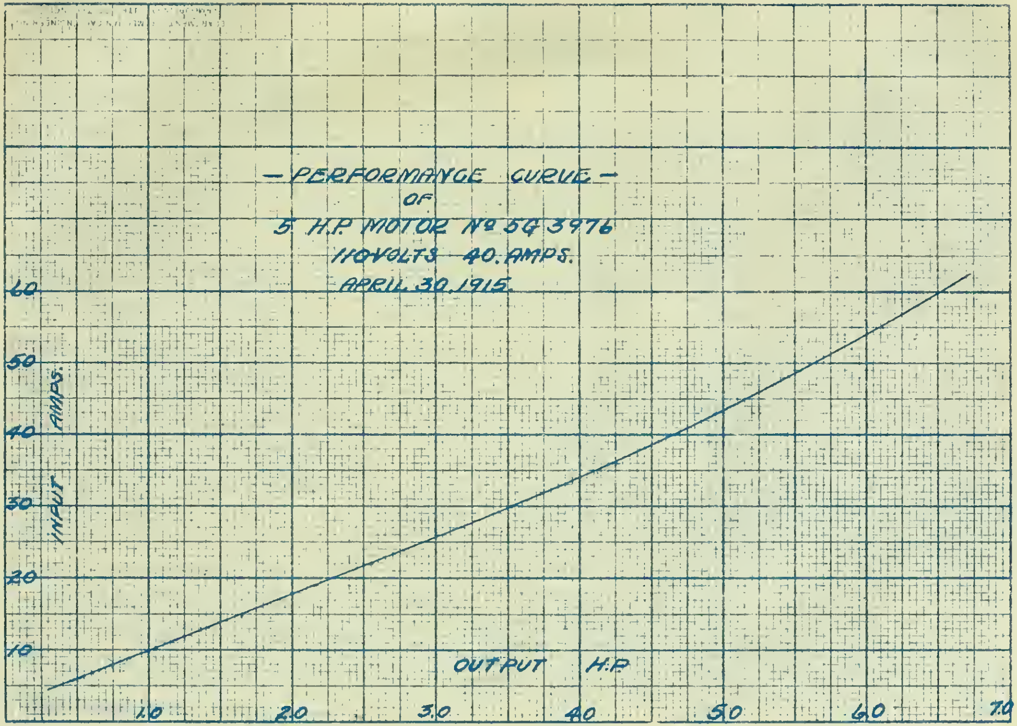
RUN NO	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	94.4	101.6	196	59.4	4.15	1.48	1208	126.5	47.1	5.35	27.7	150	39.4	20.45	.369
2	83.4	91.6	175	55.9	3.91	1.247	1127	118.0	37.8	4.40	28.3	141	40.5	20.7	.372
3	66.9	74.1	141	50.1	3.51	.901	1013	106.2	27.6	3.23	27.9	126	40.3	21.0	.371
4	56.6	64.7	121.3	46.1	3.23	.7125	928	97.3	21.6	2.475	28.8	116	41.2	20.9	.372
5	47.0	55.3	102.3	42.	2.94	.548	844	88.4	17.2	1.925	28.5	106	42.1	21.6	.374
6	39.2	39.05	76.25	38.4	2.69	.373	767	80.4	13.7	1.46	25.6	96.5	38.0	21.8	.375
7	32.6	36.9	69.5	35.0	2.45	.310	690	72.4	11.3	1.175	26.4	88.1	42.6	24.1	.380
8	27.75	29.65	57.4	32.3	2.26	.236	638	66.8	9.8	.975	24.4	81.4	41.4	25.4	.3795
9	23.7	27.7	51.4	29.85	2.09	.1955	590	61.8	8.7	.825	23.7	75.3	43.3	27.1	.379
10	20.4	18.4	38.8	27.7	1.94	.137	545	57.1	8.1	.770	17.8	69.8	38.4	32.2	.381
11	17.4	14.8	32.2	25.6	1.79	.105	508	53.2	7.8	.725	14.5	64.4	36.6	37.4	.378
12															
13															

M8

TEST OF CENTRIFUGAL BLOWER

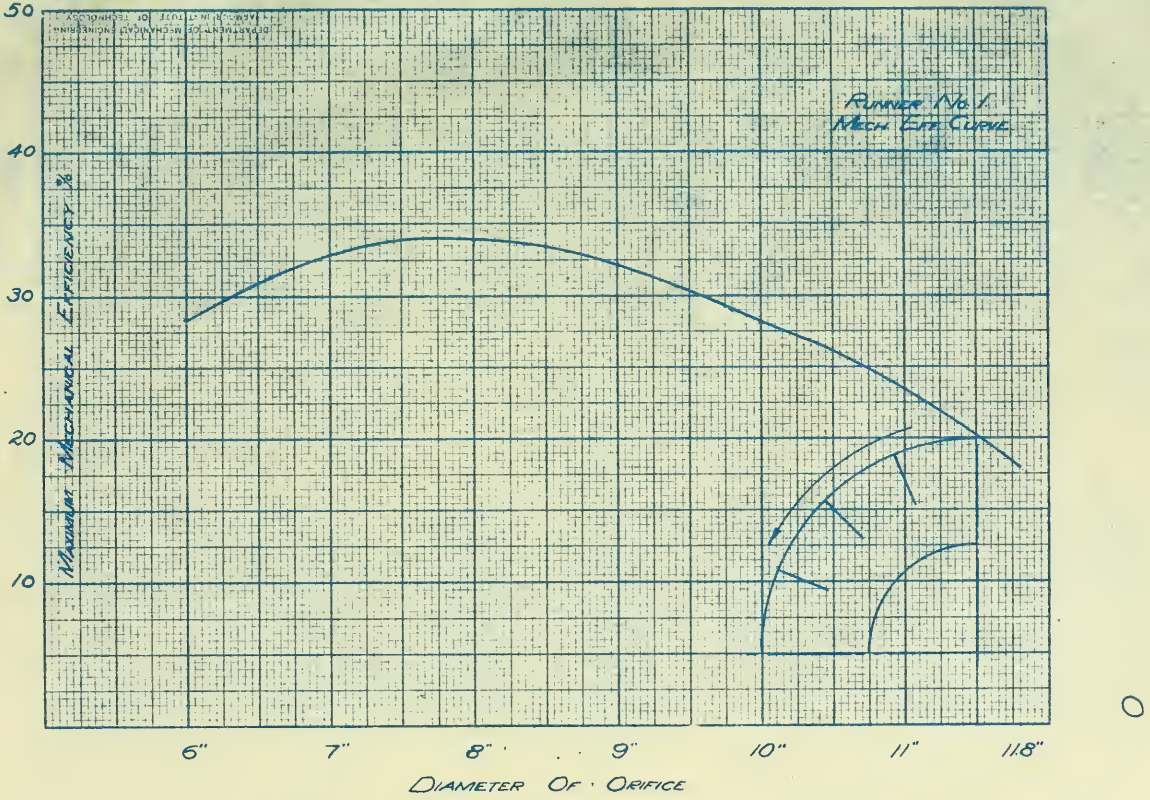
RUNNER NO. 5	DIAM. RUNNER 2 FT.	DISCH. DIAM. 11.8 IN.
NO. BLADES 35	WIDTH RUNNER 7.41 IN.	DISCH. AREA .760 SQ.FT.
VOLTS 110	DATE 4-21-15.	INLET AREA .785 SQ.FT.

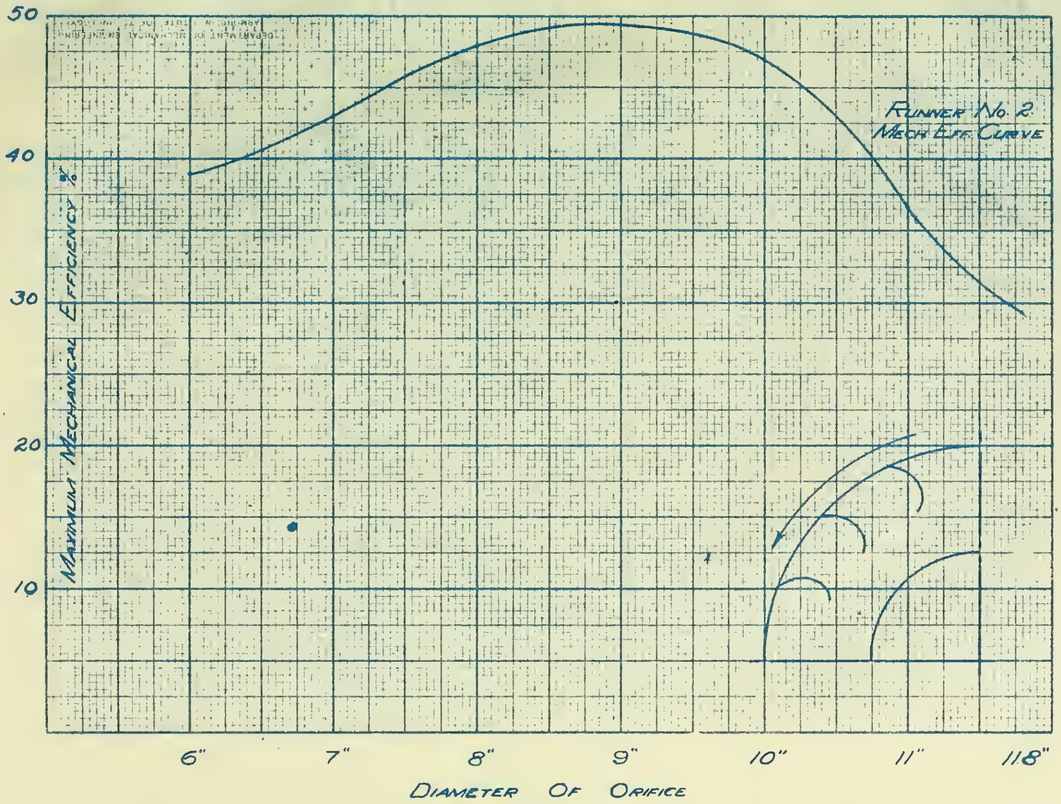
RUN NO.	VELOCITY HD. FT. OF AIR	STATIC HD. FT. OF AIR	TOTAL HD. FT. OF AIR	CU. FT. AIR MOVED/SEC.	LBS. AIR MOVED/SEC.	WORK DONE BY BLOWER H.P.	R.P.M. OF BLOWER	LIN. VEL. OF BLADE TIPS	AMPS. INPUT TO MOTOR	H.P. SUPPLIED TO MOTOR	MECH. EFF. OF BLOWER	VEL. AIR THRU EFF. ORIFICE	MAN. EFF. OF BLOWER	K_p	K_c
1	111.	2.8.	139	64.4	4.50	1.14	1210	126.9	47.8	5425	21.0	84.8	27.75	20.7	.398
2	98.1	25.1	123.2	60.4	4.23	.874	1128	118.1	38.4	4.475	19.55	79.5	28.50	21.2	.401
3	79.2	18.6	97.8	54.4	3.81	.677	1014	106.2	28.1	3.30	20.5	71.6	28.00	21.4	.401
4	66.6	16.4	83.0	49.8	3.48	.526	930	97.4	22.1	2.55	20.6	65.6	28.20	21.4	.401
5	55.5	9.3	64.8	45.5	3.18	.375	844	88.4	17.0	1.875	20.0	59.9	26.65	21.0	.405
6	47.0	9.3	56.3	41.85	2.93	.300	767	80.4	13.9	1.50	20.0	55.1	28.00	22.4	.408
7	37.8	7.35	45.15	37.5	2.63	.216	693	72.6	11.2	1.15	18.8	49.4	27.60	23.3	.406
8	32.6	6.6	38.2	34.9	2.44	.170	638	66.8	9.8	.975	17.43	46.0	27.55	25.4	.410
9	27.4	3.7	31.1	31.95	2.24	.1265	588	61.5	8.7	.825	15.32	42.1	26.50	27.4	.407
10	23.7	3.7	27.4	29.8	2.08	.104	543	56.9	8.1	.75	13.88	39.2	27.30	31.6	.412
11	20.35	1.50	21.85	27.5	1.925	.0765	507	53.1	7.8	.725	10.55	36.3	25.00	37.55	.406
12															
13															

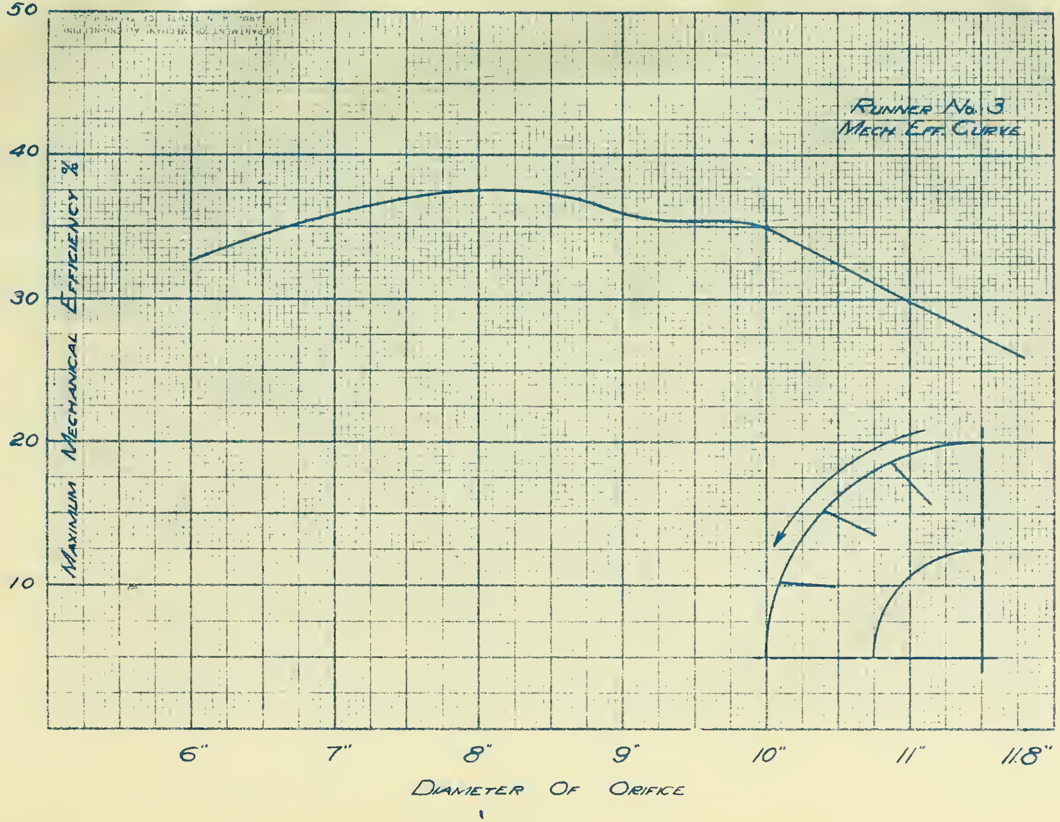


— PERFORMANCE CURVE —
OF
5 H.P. MOTOR Nº 5G 3976
110 VOLTS 40. AMPS.
APRIL 30. 1915.

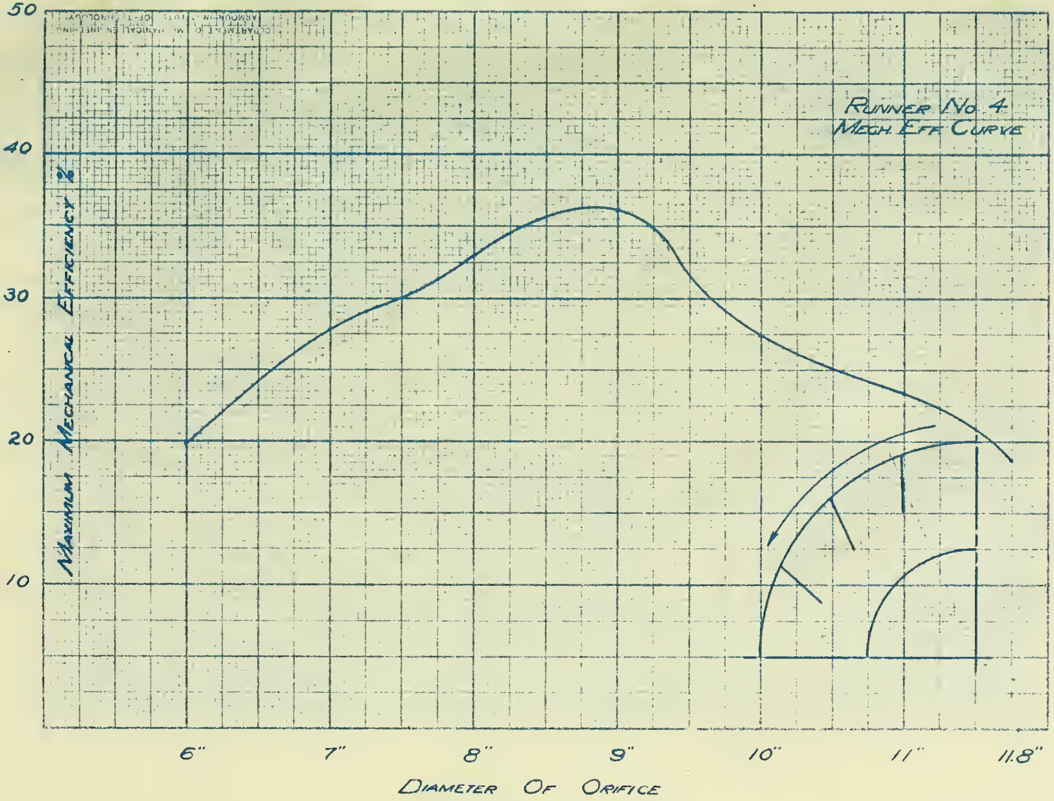
N


Runner No. 1
Mech. Eff. Curve
Maximum Mechanical Efficiency %
50
40
30
20
10
0
6"
7"
8"
9"
10"
11"
11.8"
Diameter Of Orifice
Department of Mechanical Engineering
Armour Institute of Technology

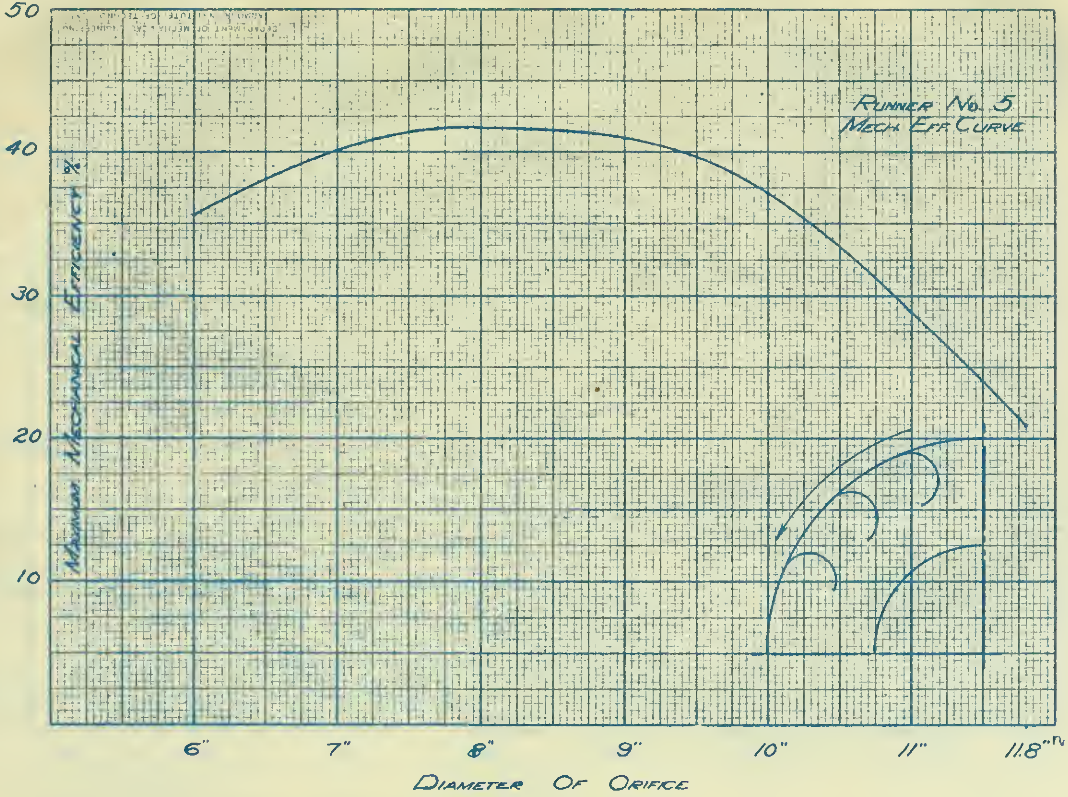

Runner No. 2
Mech. Eff. Curve
Maximum Mechanical Efficiency %
50
40
30
20
10
6"
7"
8"
9"
10"
11"
11.8"
Diameter Of Orifice

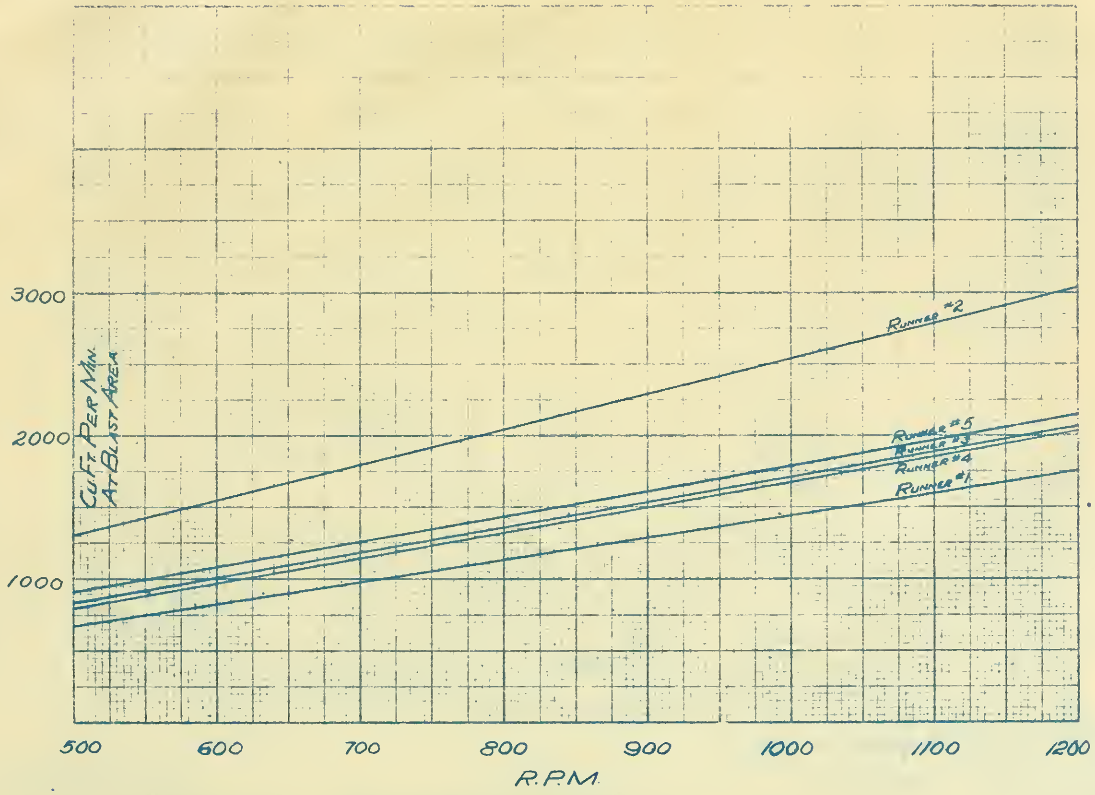

Runner No. 3
Mech. Eff. Curve
Maximum Mechanical Efficiency %
50
40
30
20
10
6"
7"
8"
9"
10"
11"
11.8"
Diameter Of Orifice

Q


Runner No. 4
Mech. Eff. Curve
Maximum Mechanical Efficiency %
50
40
30
20
10
6"
7"
8"
9"
10"
11"
11.8"
Diameter Of Orifice

R


Runner No. 5
Mech. Eff Curve
Maximum Mechanical Efficiency %
50
40
30
20
10
6"
7"
8"
9"
10"
11"
11.8"
Diameter Of Orifice


Cu.Ft. Per Min.
At Blast Area
3000
2000
1000
Runner #2
Runner #5
Runner #3
Runner #4
Runner #1
500
600
700
800
900
1000
1100
1200
R.P.M.

T